AN EVALUATION OF THE JUST WORDS INTERVENTION FOR HIGH SCHOOL STUDENTS READING BELOW GRADE LEVEL: DO SELECTED BRAIN TARGETED TEACHING STRATEGIES MAKE A DIFFERENCE?

by
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Abstract

Many high school students read below grade level. There are few evidence-based reading interventions for this population. This dissertation compared two groups of high school students who read at the elementary school level enrolled in a Reading class using Wilson's Just Words (2009) as the curriculum; one group, the control, received Just Words alone and the treatment group received Just Words + Brain Targeted Teaching Strategies (BTTS). It was a pretest-post-test lag panel group design with 9 and 7 subjects in each group. Pre-test and post-test quantitative measures included Scholastic Reading Inventory (SRI), Test of Silent Word Reading Fluency (TOSWRF), and the Word Identification Spelling Test (WIST). The WIST subtests (Word Identification and Spelling) and total score (Fundamental Literacy Ability Index) were analyzed as separate scores. These standardized reading achievement assessment scores were analyzed by comparing the average individual slope differences for the semester the students were enrolled in Reading. Few significant results were found. The treatment group silently read single words more rapidly than the control group. The control group spelled significantly better than the treatment group at the end of the semester of instruction. Other results included some student preferences and some Just Words strategies generalized to other settings following enrollment in the Just Words group and the Just Words + BTTS group. A primary principle of BTTS, setting a positive emotional classroom climate, was not maintained for the treatment group. The inability to maintain a positive emotional climate may have interfered with the overall learning for the group.

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Chapter 1: Problem Statement

By the time students reach high school, there is often a sense of urgency to ensure they have learned and mastered the K-12 curriculum (Soper & Marquis-Cox, 2012). Unfortunately, a large portion of these students, as many as 70%, are unable to read at a high school level and require remediation (Biancarosa & Snow, 2006). Text at the high school level is content driven. With teachers focused on delivering the curriculum at grade level, there is a need for effective programs to increase student literacy (Shippen, Miller, Patterson, Houchins, & Darch, 2014). Marchand-Martella, Martella, Modderman, Petersen, & Pan (2013) state that reading is the single most important skill for students to acquire during their K-12 education. The ability to read is essential to an individual's future welfare, so those who lack high school level literacy require intervention (Biancarosa & Snow, 2006). Scripted, multi-modal intervention programs like the Wilson Reading System have potentially positive effects (What Works Clearinghouse, 2013). So the question follows: if a teaching model fostered the development of multiple learning connections, would it be more effective?

The National Assessment Governing Board, the federal agency governing the Nations Report Card program, rates students' reading abilities as Basic, Proficient, or Advanced. A Basic rating is defined as incomplete mastery of the grade level knowledge with limited application and analysis. An 8th grade Basic rating is a scale score between 243 and 280. A Proficient rating is defined as the information a student should know at the current grade level. This includes knowledge, application, and analysis of text from a variety of curricular areas. An 8th grade Proficient is a scale score between 281 and 322. An Advanced rating includes all the skills designated as Proficient as well as the ability

to analyze, evaluate, and synthesize multiple texts, and the scale score is greater than 322 (National Center for Education Statistics, 2012). According to the Nation's Report Card (2013), 24% of the 2011 eighth grade students scored Below Basic with a scale score below 243. Only 34 % scored at or above Proficient. These statistics indicate that 66% of students are not able to read at or above grade level. The Maryland Report Card (Maryland State Department of Education, 2014) confirms these statistics. In Maryland, 60% of eighth graders enter high schools reading below Proficient. This impacts students' ability to access textbooks and other print information that is written at least on grade level if not above grade level for the content area.

Another measure of reading ability is using Lexiles. Lexiles were developed by MetaMetrics in the mid to late 1990's. A Lexile is a score that is assigned to a text and is associated with expected grade level achievement. For each grade, a range of Lexile scores has been established. Aspects of both semantics (word frequency) and syntax (sentence length) are utilized to determine the Lexile for a book or any written text. A student entering high school should be reading at 1050L based on the expectations of the Common Core State Standards (Hiebert, 2012).

Some students who read below a proficient level in high school choose to drop out due to the overall academic failure and frustration they experience in not being able to read efficiently (Convissor, 2013). Others may feel unable and inadequate to pursue post-secondary education alternatives. Colleges have only recently begun to offer remediation classes for students not able to enter the introductory college courses in English. By implication, industry and business standards may not be met by many high school graduates due to their lack of reading skills (Cowan, 2009). Mellard, Woods, and

Desa (2012) studied a group of 202 AmeriCorps trainees that were experiencing difficulty with learning new information. Results of a variety of reading assessments found the trainees had functional literacy skills similar to 8th grade students. This discrepancy in reading ability was confirmed by the study completed by Strom and Strom (2013). They researched the reasons students drop out of post-secondary programs and found that while the most common answer was due to conflicts with jobs, the second most common response was the difficulty of the coursework including reading the texts. These students reported that high school did not adequately prepare them for the significant challenges of college courses.

The National Reading Panel (NRP) released a report in 2000 defining the reading process. The report titled, "Teaching Children to Read: An Evidence-Based Assessment of the Scientific Research Literature on Teaching and Its Implications for Reading Instruction", was a compilation of two years of research, reviewing studies related to many aspects of reading and focusing on the development of young readers. The Panel identified five "Pillars" of reading competency: phonemic awareness, phonics/decoding, fluency, vocabulary, and comprehension. Along with the understanding of these areas of reading competency outlined by the Panel, is the need to understand best teaching strategies to maximize student learning. One emerging strategy showing promising results has been Brain Targeted Teaching (BTT) (Hardiman, 2003).

Brain targeted teaching and information from current brain-based research have been helpful in structuring classroom learning environments and creating lessons (Willis, 2006). Willis describes how using multiple modalities in learning information creates multiple brain pathways which lead to greater long term memory and recall. An

individual is more likely to be able to retrieve that information efficiently when information is transferred to long term memory through a greater number of pathways in the brain. Research suggests that brain targeted teaching strategies provide multiple ways for students to incorporate information into their memories (Willis, 2007; Saleh, 2012). While some rote memory activities are necessary for basic content learning (i.e., counting), the BTT strategies create a greater likelihood for information to be recalled (Hardiman, 2012).

Hinton, Miyamoto, and Della-Chiesa (2008) discuss how knowledge of the neuroscience of learning helps educators design interventions for students who are not proficient in literacy. These below grade level readers need effective interventions. Research in neuroscience indicates that successful intervention requires connecting already learned information with new information (Bui and Fagan, 2013). By accessing students' prior knowledge, the likelihood of making multiple connections to new information is increased. Using prior knowledge is one way to ensure learning will transfer into long term memory. Rote memorization without these connections is the least likely strategy to produce knowledge that can be recalled (Willis, 2007). Willis encourages teachers to develop learning activities that allow students to make numerous connections so that information placed in long term memory will be more readily retrieved, demonstrating a maintenance of learned material.

Reading Remediation in High School

Allington (2013) states the best teachers in a school should be the ones to provide interventions for struggling readers. In practice, many paraprofessionals are assigned to work with the low achieving students and few high school teachers have the specialized

education necessary to be certified reading specialists. Pre-service teacher preparation programs do not necessarily include the most recent evidence-based research findings with applications of neuroscience and cognitive science. Nor do they provide secondary education teachers with any in-depth understanding of basic reading instruction (Radin, 2009). Without this early training or later professional development, teachers are often unable to explain why they do what they do when they teach. Developing literacy skills in adolescents should be based on current brain-compatible teaching. An understanding of how the brain functions during learning should be part of a total conceptual framework for teachers (Radin, 2009).

There are times during instruction when teachers need to provide low level readers with texts on their current reading level. For example, if a ninth grade student with a fourth grade Lexile is reading a high school level Government textbook, the student will struggle with vocabulary and comprehension. Allington (2013) believes texts need to be read with 98% accuracy in vocabulary and 100% comprehension. Current texts in school do not meet the needs of these low level readers (Leiko, Mundy, Kang, & Datar, 2013). Unable to accurately read materials and comprehend the information, these students are too often given assignments with little text in lieu of meaningful reading activities (Allington, 2013).

Heller (2013) discusses how the National Reading Panel's five pillars of literacy: phonemic awareness, phonics, fluency, vocabulary, and reading comprehension, were developed for young readers. Heller recommends that readers in grades 4-12 need new priorities: word study, fluency, vocabulary, reading comprehension, and motivation. In Heller's recommendation, he replaces phonics with a "new" pillar: word study. Word

study is different from phonemic awareness and phonics because, according to Heller, older children have many of those basic sound symbol connections. However, many older children are unable to efficiently read polysyllabic words, sight words, irregularly spelled words, and words with prefixes and suffixes. This is how explicit word study instruction, which does include phonics and/or phonemic awareness, can be beneficial to high school readers. Since there are students who do not have mastery of phonemic awareness or phonics skills as adolescents, this dissertation will concentrate on these areas along with word study.

One part of word study is morphology. Morphology is the study of parts of words such as roots, prefixes, and suffixes that influence word meaning. Morphology uses these word parts as the means of recognition and comprehension. Pacheo and Goodwin (2013) recommended that morphology be taught in context while reading text. An effective instructor needs a good understanding of each student's oral language knowledge to weave together familiar and unfamiliar word parts to make new words. Another strategy is disassembling words into separate parts (prefix, root, and suffix) to determine word meaning. By determining word meaning, learning extends to developing vocabulary, word recognition, and eventual comprehension. By recognizing word parts, students can decipher unfamiliar words. When confronted with a new word that has similar construction to a known word, it is easier to read and the reader is then able to generalize meaning. Similar meaning, along with an understanding of the reading context, helps readers identify new words (Pacheo and Goodwin, 2013).

In a meta-analysis of studies related to teaching struggling middle and high school readers, Joseph and Schisler (2009) found 23 studies conducted between 1986 and 2006

that met their criteria. The four criteria included: (1) students who attended either middle school or high school, (2) studies that examined the implementation of word reading intervention or instruction, (3) studies with a dependent variable measuring reading achievement, and (4) studies that manipulated the independent variable to measure the dependent variable. Their findings support the explicit, systematic teaching of basic reading skills, including: phonics, word recognition, fluency, and comprehension to secondary level students.

Research conducted at the California State University (CSU) determined that an increasing number of entering college freshmen were lacking in reading skills (Knudson, Zitzer-Comfort, Quirk, and Alexander, 2008). As many as 46% of prospective students needed to take remedial classes prior to taking College English I. In order to address this deficiency CSU researchers developed a course for twelfth graders in local high schools called the Expository Reading and Writing Course (ERWC). An evaluation of the students who completed ERWC found that they had higher levels of reading proficiency on the college entrance exam and were more likely to outperform their non-participating peers on reading and writing college entrance exams. When high school students who read below grade level enrolled in an intervention, they made greater improvements than the students who participated in a traditional high school program.

Malmgren and Trezek (2009) studied secondary students with disabilities and their specific literacy needs. Using the NRP's five pillars of reading competency they reported on 17 reading intervention programs rated by the Florida Center for Reading Research. In this report, the Wilson Reading System received the highest marks in four out of the five reading components.

One specific reading intervention program designed by the Wilson Language Training Corporation is Just Words. Wilson's Just Words program addresses all of the NRP's five pillars in the 14 units of study. While the Just Words program has only been field tested, it is a condensed version of the Wilson Reading System that has been shown effective in increasing reading abilities of adults and in students in grades 4-12 (Malmgren & Trezek, 2009; Wilson 2009).

Heller (2013) gives teachers the following recommendations for reading instruction with adolescents: less is more when learning new words, lessons should be relevant, and make lessons fun. These suggestions from Heller add a practical element that is needed to engage struggling high school readers who are highly reluctant to participate in an intervention. Wilson's Just Words program incorporates Heller's recommendations in its design. Just Words has specific High Frequency and Demonstration Words (words related to the unit topic) incorporated into each of the 14 units which is an example of "learning new words".

Brain-based Research in Education

Recent research investigating how the brain functions has helped move educators towards a deeper understanding of student learning. According to Hruby and Goswami (2011) and supported by Radin (2009) research has highlighted the critical role of teachers in providing reading instruction. Radin (2009) reported that while teachers may have an understanding of how to teach reading, it is the quality of their instruction that truly impacts the growth of students. An increased knowledge of the relationship between the brain and learning is essential for teachers. This advanced understanding of neural function allows them to strive for quality instruction which will increase student

achievement and provide these teachers with a personal increase in job satisfaction (Radin, 2009).

One area of neural function that impacts instruction is executive function. Blakemore and Choudhury (2006) define executive function as the "capacity that allows us to control and coordinate our thoughts and behavior" (p. 301). While there is a rapid development of executive function during preschool, there is another growth period during adolescence into young adulthood. This later period of maturation is important for students to successfully participate in school. If the prefrontal control areas develop at a slower rate, school related expectancies may be difficult to achieve (Howard-Jones, 2010).

The past three decades of brain research and technology have grown in scope and clarity due to resulting data via the fMRI. It is now possible to image brain function (activity) during learning activities (Willis, 2006). Caskey and Ruben (2003) added that teachers were not surprised when they learned of the significant brain growth in students ages 10 – 15. For many years teachers have observed students' behaviors and it was obvious to them that the adolescent brains are emerging to adulthood but not yet there. Konrad, Firk, & Uhlhaas (2013) describe adolescent brain development as a time when there is an increase in white matter, a decrease in synapses as a result of their reorganization, pruning/proliferation, and changes in neurotransmitter systems. These physiological changes contribute to growth in the adolescent brain resulting in adult status. Caskey and Ruben (2003) recommend teachers use the knowledge neuroscientists have shared with educators to impact instruction, to adapt their curriculum, establish

classroom practices and routines, to teach students about their brains, and to adapt more effective instructional strategies.

One phrase that is used to refer to the cross fertilization of brain-based research and education is "Mind, Brain and Education." Sousa (2010) summarized the many scientific developments that brain research reveals to educators, including: (a) the brain can rewire itself and (b) the importance of sleep as it relates to memory. Other research has shown the link between students' emotions and the limbic region which is the portion of the brain that acts as an affective "filter" (Willis, 2007) allowing them to experience a range of emotions and impacting their brain function. Willis adds that brain research in executive functioning supports the benefit students receive in explicit instruction. The need for explicit instruction is supported by Hruby and Goswami (2011), Marchand-Martella, et al. (2013), and Pacheo and Goodwin (2013). It is more likely students will follow through with meeting instructional and behavioral expectations if they are provided direct teaching for organization and efficiency.

Another important area of brain research describes the significant findings on the relationships between neurology and the reading components of decoding, fluency, and comprehension. Joseph and Schisler (2009) found reading intervention programs do help adolescent readers increase reading achievement. Published programs such as Great Leaps, Pals (peer-mediated intervention), Language!, and repeated readings, significantly increased student reading fluency and reading comprehension. Hruby and Goswami (2011) urge reading education researchers to be careful in interpreting neuroscience findings. This is a new field of research and many of the studies are relatively recent and have not been replicated. Further, because the field of brain research is rapidly changing

due to the increase in technology, general research methods are not yet well established. Willis (2008) recognizes the difficulty teachers have in reading neuroscience primary sources. Building a bridge between scientists and educators will assist in interpreting the vast body of research and identifying educational strategies.

The Brain – Targeted Teaching Model

The level of technology to analyze the brain has increased exponentially during the past three decades (McCall, 2012). While there are significant findings about the brain, there is little evidence to directly tie effective instructional practices to the brain function of students (Willis, 2008). What has been learned from brain research should make a difference in what teachers do. *Connecting Brain Research with Effective Teaching: The Brain – Targeted Teaching Model* (Hardiman, 2003) and *The Brain – Targeted Teaching Model for 21st Century Schools* (Hardiman, 2012), two neurologically evidence-based texts related to the importance of integrating current neuroscience to teaching and learning, have offered a cohesive practical method for teachers to read and implement in classroom practice/strategies.

One strategy both Hardiman (2003) and Willis (2006) have discussed is the emotional climate of the classroom. If a student is uncomfortable, stressed, or overly frustrated, new information is less likely to gain access to the memory portions of the brain and minimal, if any, learning takes place. The opposite is also true. A student who is comfortable, relaxed, and in an overall feeling of contentment has the ability to take on a reasonable challenge. This student's brain is better able to access working memory, verbal fluency, and problem solving. Along with these learning strengths, positive student behavior is also noted. The teacher who can control the classroom climate, works to

create a setting in which the students are likely to successfully make the brain connections that facilitate learning.

Another strategy area is the physical environment of the classroom. Caine, Caine, McClintic, and Klimek (2009) call teachers to engage students in experiences within the classroom that involve the whole student (physical, mental, and emotional). The classroom should continually show some novelty to provide authentic reasons for the students to engage in the environment (Hardiman, 2003). Hardiman continues on with a list of ways the physical setting of the classroom can be arranged and/or changed for the sensory stimulation of the students. Some examples include (a) scented oil, (b) displaying pictures and sayings, (c) varied seating, natural light, and (d) music. Each of these strategies is purposefully planned by the teacher to provide some novelty for the students' brains to seek out.

As the brain seeks out novelty (Hardiman, 2003), the world around students and teachers is continually changing. With changes in work place settings and the types of work required comes the need for a different employee. The 21st century employee is required to be an expert thinker and complex communicator. The demands on the brain to continually organize and develop complex neural pathways are an integral part in becoming a desirable employee and schools, out of all places, have the opportunity to train these future employees (Willis, 2006). Designing the learning experience is an essential part of the brain-targeted teaching model. One purpose of instruction is to create meaning through developing the underlying concepts. Willis describes how the brain takes this information and creates pathways. The more the information is developed and expanded, the greater the number and density of the neural pathways making it more

likely for the student to not only recall information but to be able to manipulate the information as well. This task revolves around the executive functioning skills of the brain (Cain et al., 2009).

It may seem that all of these strategies represent general "good teaching." While the strategies may be described as such, the point is that the strategies are a planned and prescriptive approach. The teacher prepares the lesson with knowledge of the individuals in the class as well as behaviors s/he will carry out to maximize student learning. Hardiman (2012) recommends a lesson begin with giving the students the big picture of what learning will be accomplished through a concept map. The concept map lists what will be taught in the upcoming unit. Throughout the series of lessons, the teacher refers back to the concept map as discreet skills and new ideas are taught. This gives the students necessary connections for deeper understanding and memory. Students' prior knowledge or related coursework are also drawn into lessons to provide hooks to attach new information. The attaching of new information to prior knowledge creates a more secure network to ensure long term learning.

Purpose of the Study

High schools today report as many as 60% of their students reading below the Proficient rating (Maryland State Department of Education, 2014). Just Words, a published reading intervention program for adolescents, is based on the research-based Wilson Reading System (Wilson, 2009). While this program is multimodal to include the successful aspects of an Orton-Gillingham approach to reading instruction, it is also an evidence-based intervention for students Grades 4-12 who are reading below grade level. The Brain Targeted Teaching Model melds knowledge of brain research with successful

teaching strategies and activities. This study will examine the benefit of brain targeted teaching strategies on the acquisition of reading skills in ninth and tenth grade students who are reading below grade level. The research question asks if there will be a difference in the impact of a reading intervention used with Just Words and Brain Targeted Teaching Model compared to Just words alone.

Research Hypotheses

1.0 There will be a difference in the reading achievement scores on the Scholastic Reading Inventory (SRI) for the students enrolled in Just Words and Brain Targeted Teaching compared with student in Just Words alone.

2.0 There will be a difference in pre- and post-reading fluency assessments (Test of Silent Word Reading Fluency) for the students enrolled in Just Words and Brain Targeted Teaching compared with students in Just Words alone.

3.0 There will be a difference in pre- and post-word identification, spelling, and sound/symbol knowledge assessments (Word Identification and Spelling Test) for the students enrolled in Just Words and Brain Targeted Teaching compared with student in Just Words alone.

3.1 There will be a difference between the slopes of the control and treatment groups in their ability to identify words on the WIST.

3.2 There will be a difference between the slopes of the control and treatment groups in their ability to spell single words on the WIST.

3.3 There will be a difference between the slopes of the control and treatment groups in their fundamental literacy ability index on the WIST.

4.0 Students enrolled in Just Words and Brain Targeted Teaching will express greater satisfaction with the program through the student survey when compared to students in Just Words alone.

4.1 There will be a difference in the student satisfaction of the Just Words reading class they were enrolled in.

4.2 There will be a difference in the use of the seven decoding strategies for the students enrolled in Just Words and BTTS compared with students enrolled in Just Words alone.

4.3 There will be a difference in the preferred setting when receiving new information for the students enrolled in Just Words with BTTS compared to students enrolled in Just Words alone.

4.4 There will be a difference in student opinions for the students enrolled in Just Words with BTTS compared to students enrolled in Just Words alone.

Chapter 2: Literature Review

As described in Chapter I of this document, there is a significant need across the United States of America to teach adolescents to read better. Finding age appropriate, evidence-based strategies and programs for students this age is a challenge. Referring back to the National Panel of Reading's (2000) description of the five pillars of literacy, this literature review describes current research findings related to Phonemic Awareness

and Phonics, Fluency, Vocabulary, and Comprehension instruction for adolescents. Heller (2013) slightly modifies the five pillars by substituting Word Study for Phonemic Awareness and Phonics. While Heller may not believe Word Study is important for adolescents, it is a significant part of the Just Words (JW) program, therefore, it is included in this review. The impact of strategically injected Brain Targeted Teaching Strategies (BTTS) is also described.

Phonemic Awareness and Phonics

Walsh (2009) lists 17 different definitions of Phonemic Awareness by at least that many researchers. The combined message is phonemic awareness is the ability to hear and manipulate the individual sounds that make up words. Whether this skill is a necessary prerequisite for reading is debatable but it is a skill that connects how words are spoken and how words appear in print (Walsh, 2009). Heller (2013) states "nearly all adolescents . . . have at least some ability to sound out words" (p. 1). Some students do not need direct instruction of phonemic awareness or phonics. While this is true, the students who cannot segment and blend sounds struggle with both decoding and encoding words accurately (Harris, 2007). This includes both the reading and spelling of words; especially, reading and spelling multisyllablic words.

While phonemic awareness emphasizes the hearing and manipulating of sounds, phonics helps the beginning reader to learn the letter-sound patterns in English. It is the encoding of the written word; taking the sounds heard along with the letters in print and blending them together to form a spoken word, that is represented by print letters (NRP, 2000). As in phonemic awareness there are numerous definitions for phonics. Since

phonics is one of the building blocks established by the NRP (2000) that is the working definition utilized for this research.

In a meta-analytic review, Melby-Lervåg, Halaas Lyster, and Hulme (2012), looked at the role of phonological skills (phonemic awareness, rime awareness, and verbal short-term memory) in learning to read. The review included 235 studies with 995 effect sizes. Results revealed that phonemic awareness is the one skill that determined an individual's ability to read. When rime awareness and verbal short-term memory were statistically controlled for, phonemic awareness continued to be the strongest indicator of individual reading ability. In concluding statements, Melby-Lervåg et al. (2012) confirm the importance of explicit instruction of phonemic awareness in order to improve individual reading ability. These results were also confirmed by Thomson, Leong, and Goswami (2013). They established that if students continue to have phonological difficulties, the students' reading and spelling will not reach the automaticity level. To establish literacy, it was concluded that phonological skills are necessary for students to be efficient readers.

In a study of adolescent and adult beginning readers, Royer, Abadzi, and Kinda (2004) developed four instructional treatment groups from 425 students in rural areas of Burkina Faso, a small country in West Africa. The groups included the following treatments: (a) Phonological Awareness, (b) Rapid Reading, (c) Phonological Awareness and Rapid Reading, and (d) the Control group. All students participated in the traditional lessons, but the three experimental groups added one or both of the add-on treatments. The Phonological Awareness group worked on phonemic awareness, syllable structures, and word study. Rapid Reading or Speed word-recognition training gave participants

opportunities to read sets of 20 words with increasing complexity as quickly as possible. This treatment was designed to increase reading fluency. The third group combined both the Phonological Awareness and Rapid Reading treatments. The Control group used the traditional reading education plan.

Results for the Royer et al. (2004) study indicate all three treatment groups outperformed the control group. Royer et al. (2004) report "adult literacy programs were enhanced by adding instruction focusing on identifying the constituent sounds of spoken language and/or practicing the rapid identification of written words" (p.68). One recommendation from Royer et al. (2004) is to provide a sequence of instruction that begins with phonological awareness, sounds in words/syllables, and word recognition including word meaning,

Calhoon, Sandow, and Hunter (2010) made a study of middle school students with reading disabilities enrolled in remedial reading programs. They stated that older students with reading disabilities that include poor phonemic awareness require direct instruction at the sound-letter level. Teaching students the most basic levels of phonemic awareness and phonics is essential to their eventual need for reading multisyllable words.

The Calhoon et al. (2010) study focused on determining if there is one best way to deliver the components of reading instruction. The three groupings used with 90 middle school students (grades 6-8) include: (a) Alternating days of instruction between Linguistic skills (phonemic awareness, phonics, and syllable structures including morphology) and Comprehension, (b) Integrating Linguistic skills, Spelling, and Fluency while alternating days of instruction on Comprehension, and (c) the Adding strategy of starting with Linguistic Skills and adding Spelling after seven weeks, then adding

Fluency after another seven weeks, and finally adding Comprehension after another seven weeks. Results emphasize all students made significant gains, however, the students who had more explicit Linguistic Skills and Spelling instruction (the Adding group) made more gains in these areas than the other two groups. Overall Calhoon et al (2010) demonstrated that developing a strong base of linguistics, spelling, and fluency allow students to better generalize the skills for reading comprehension. This is a positive argument for the importance of phonemic awareness, phonics, and syllable structures to be taught to adolescents with reading disabilities.

A dissertation by Pare-Blagoev (2012) reviewed neuroimages of normal reading children in an effort to join neuroscience and literacy research. Specifically, Pare-Blagoev viewed the parts of the brain involved in phonemic awareness skills when no text was present. Besides identifying very specific sections of the brain, one of her conclusions is that it takes more energy for children's brains to do phonemic processing tasks. Also, these skills are not as involuntary in children as they are in adults.

There are some published programs for older students and/or adults that do follow the recommendations of previous studies. Several of these programs are developed from an Orton-Gillingham-based reading instruction system. An Orton-Gillingham (OG) reading program is a "systematic, sequential, and multisensory" program based on the research of Samuel Orton (Giess, Rivers, Kennedy, and Lombardino (2012), p. 61). The multisensory component includes activities and strategies that access the visual, auditory, and tactile-kinesthetic brain pathways. Important aspects of an OG program are decoding and encoding which are used along with explicit teaching in phonology, phonological awareness, and sound-symbol correspondence (phonics). Based on the OG principles,

decoding and encoding are used with students with many types of reading disabilities. Giess et al. (2012) state it is the program's ability "to strengthen specific links or components of the reading process, regardless of the reasons underlying the student's weakened literacy skills" (p. 61) that makes it effective.

Giess et al. (2012) used the Barton Reading and Spelling System (BRSS) (another OG based program) to determine if the BRSS is an appropriate, effective intervention for older students who have unresolved reading problems. Following the intervention with nine students, results revealed that students must have a strong base in phonological awareness skills before attempting the rigorous reading and writing activities of secondary curriculum.

Harris (2007) implemented an informal study of Words Their Way (WTW) with a group of 15 ninth grade students reading at the elementary level. While WTW focuses on word study, it does have a phonemic awareness component. Students learn letter-sound combinations, along with word structures and syllable patterns. These students made progress in one semester.

A significant part of phonemic awareness and phonics is the decoding and encoding of syllables. In the English language a syllable has from one to six sounds (Wilson, 2009). The Wilson Reading System teaches student to orally segment words/syllables by "tapping". The tapping of each sound using one tap for each sound promotes decoding. After the word is tapped, the sounds are blended together for encoding and oral production of the word/syllable (Wilson, 2009).

In Depth Word Study

Another important aspect of literacy development for adolescents is In Depth Word Study, or just Word Study. Word Study takes students' sound-letter knowledge to build syllables/words. English words are typically divided into Phonetically Regular Words and High Frequency/Sight Words. Pacheo and Goodwin (2013) also include learning word meanings as part of Word Study. They encourage the identification of root words as an appropriate strategy for mastering the denotation of unfamiliar terms.

Following the NRP's delineation of the five necessary evidence-based practices in reading instruction for Kindergarten – third grade, other researchers including Pacheo and Goodwin (2013) looked to determine how could this framework transfer to older students, fourth – twelfth grade, and possibly even adults. Biancarosa and Snow (2004, 2006) published *Reading Next - A vision for action and research in middle and high school literacy: A report to Carnegie Corporation of New York.* This work is often cited as a seminal piece in developing effective literacy programs for adolescents. While Biancarosa and Snow's work does not list Word Study, it does outline the Strategic Instruction Model (SIM) which begins with the Word Identification Strategy. The Word Identification Strategy addresses (a) decoding multisyllable words, (b) syllabication rules, and (c) roots, prefixes, and suffixes. These three skills are important components of Word Study. Biancarosa and Snow's work is how the five components of literacy for Grades 4-12 excluded Phonics and Phonemic Awareness but included Word Study.

Marchand-Martella, Martella, Modderman, and Petersen (2013a) describe the key areas of effective adolescent literacy program. In their list, Word Study is listed first. They explain Word Study as when the instruction focuses on single words. Marchand-

Martella et al. (2013) list five activities for word analysis and word recognition strategies: (a) divide word into syllables, (b) use syllable type knowledge to encode the word, (c) study rules for irregular words, (d) learn word roots and affixes, and (e) use word analysis knowledge to read unfamiliar words. Since multisyllable words are a significant part of most texts adolescents read, it is important for them to correctly pronounce each word.

In a separate article, Marchand-Martella, Martella, Modderman, Petersen, and Pan (2013b) express how in order to develop meaning from a text, it is essential to read mutisyllable words. Marchand-Martell et al. (2013b) also emphasize the importance of explicit instruction in phonemic awareness if a student lacks these basic skills. So Word Study is not always the first need for adolescent literacy instruction.

Solis, Miciak, Vaughn, and Fletcher (2014) made Word Study part of the standard intervention for adolescent students with reading disabilities and poor reading comprehension. However, those with below average decoding skills were provided almost 300% more time on Word Study than average decoders (Solis, et al, 2014).

Phonetically regular words. Wilson (2009) describes the English language as logical. While there are irregular words, the majority are phonetically regular words. A strategy that helps students read words is to identify the Syllable Structure of each syllable in a single word. Once students can divide a word into syllables, they can decode the phonetically regular word using their sound-letter knowledge. By breaking a word into its syllables it is important to know the syllable type because it is the syllable type that tells how the vowels should be read. Most students easily learn the sound-letter pairing for consonants but it's the vowels that are difficult. Consider the vowel "a". It can

make at least two sounds (the short and long sounds). However, if you put an "r" or another vowel next to the "a", more sounds are created (/ar/, /ai/, /ay/, or /a-consonant-e/).

Learning all of the possible vowel sounds can be difficult for many students. Johnson Donnell (2007) discovered the third grade students' weakness was the application of sound-letter principles. A significant need for students to increase their ability to read vowel sounds was noted. Using this knowledge the author developed 60 word study lessons focusing on vowel-spelling patterns. After the intervention, the data supported the implementation of the program as a whole class instructional model. While comprehension did not improve, overall decoding skills increased.

In *Why Teach Spelling*, Reed (2012) explains how phonemic patterns aid students in reading words. One of the patterns includes the rule for when the letter "c" is pronounced as /k/. Another pattern is word families or what Wilson (2009) describes as "welded sounds". By knowing these phonemic patterns students pronounce new words confidently.

Cheatham and Allor (2014) describe the connection between reading decodable (phonetically regular) text and reading performance and progress. When students are provided decodable text, their reading fluency increases. By mastering the phonetically regular words, a student reads with greater ease.

Syllable structure. Reed (2012) describes another strategy for reading words and that is to identify each of the syllable types in a word. There are six syllable types in English (see Appendix D). Wilson (2009) outlines these six syllable types in the Just Words manual and by the end of the fourteenth unit, the students have been introduced to and practiced all six types.

The first syllable type is the closed syllable which includes one vowel and is closed off by one or more consonants. This is a good starting point because students typically know the short sounds of vowels and work with Consonant – Vowel – Consonant (CVC) words like "top". The second syllable type is the vowel consonant-e pattern. Words like "cake" have a vowel, then a consonant followed by the letter "e". This syllable type is also a easily recognized by students. They seem to know that the "e" causes the vowel to be the long sound. The third syllable type is the open syllable which has one vowel that is not closed off by a consonant. For example, "me" as a word or syllable ends with a vowel making the long sound.

After the students master the first three syllable types (80% accuracy), they work on the fourth syllable type, the R-controlled syllable. The pattern of vowel + "r" makes a distinct sound, like in the words "car, or, her, bird, and urn". The fifth syllable type is the double vowel. Double vowels often make more than one sound, like "ie" can say the long "e" or the long "i" sound. This pattern takes practice to recognize. Finally, the last stable syllable type is a consonant +"le" like in "little" or the ending "-tion" like in "vacation".

Studies by Cohen and Brady (2011), Harris (2007), and Kairaluoma (2007) discuss reading interventions that focused on specific syllable types. Harris (2007) as well as Cohen and Brady (2011) identified the Closed, Double Vowel, and Vowel-Consonant-e Syllables as the primary targets in Word Study. Both student groups increased their abilities to decode new words. Harris (2007), whose study was with adolescents, reported that a secondary effect of the study was the students reported and demonstrated more confidence with writing.

In direct instruction, as students become proficient at discriminating each sound-letter pattern in closed syllables/words, additional syllable patterns are taught (Wilson, 2009). Blevins (2000) makes a case that as students advance through each grade, they begin to be confronted with unfamiliar words. However, the strategies learned in the primary grades may not help the students decode this new vocabulary. Blevins (2000) suggests teaching students to view words not as individual sounds but as syllables or chunks with patterns that can be identified. Then he systematically teaches the six syllable patterns along with blending the syllables together to produce/read the whole word.

Orthography and morphology. Part of Word Study is to explicitly teach students orthographic rules and the morphology used in the English language. Goodwin and Ahn (2010) completed a meta-analysis of 17 independent studies with 79 mean-change differences. The focus of the studies was morphological interventions on students with reading difficulties. In conclusion, Goodwin and Ahn (2010) report that explicit morphological intervention does make a difference for students who read below their same age peers.

Goodwin along with Pacheo (Pacheo and Goodwin, 2013) looked at what morphological problem-solving strategies middle school students' use when reading new words. Morphological knowledge includes the meaning of root words (base words) as well as meaningful affixes to determine the new word's meaning. For example, a new word "publisher" is given to the student who knows the word "publish" means "to make public or print documents" and the suffix "-er" makes the word refer to a person. So the

student takes this morphological knowledge to define the new word as “someone who makes public or prints documents”.

The Pacheo and Goodwin (2013) study consists of interviews with students to make meaning out of 12 morphologically complex words in 20 minutes. Following interviews with 20 middle school students, the researchers describe four different strategies observed. The strategies were: Part to Whole, Parts to Whole, Analogy, and Whole to Part. So the suggestions for instruction include modeling different ways of looking at a word, as well as looking at how one word might require one strategy and another word requires a different strategy. Modeling the different ways of looking at a word is using the morphological knowledge to create meaning and manipulating the word parts (root word, prefix, and/or suffix) that creates the understanding of the new word. Some of the suggested activities include ways students can make connections with this knowledge through their use of social media. Even the word “connections” has a root word and suffix.

Another 2013 Goodwin study, this time with Gilbert and Cho (Goodwin, Gilbert, & Cho, 2013) analyzes middle school students’ ability to read a derived word (a root word with one or more affixes) if they can read the root word when written separately. Results show students are more likely to read the derived word if the root word is correctly read. While the researchers report there is not one specific morphological instructional model that is more effective than others, they clearly support the direct instruction of root words, prefixes, and suffixes as essential in helping adolescents to increase reading abilities.

Sixteen students participated in a study to assess how direct instruction of morphological awareness impact reading and spelling (Kirk and Gillon, 2009). One morphological pattern used in the intervention was adding a suffix to a baseword. The suffixes included: -er, -est, -ing, -y, -ed, -iest, , -ier, -ly, -ish, -en, and –ened. The intervention activities included a variety of word sorts and teacher think alouds while prompting the students to write the morphologically complex words. Results indicated all students increased morphological awareness for both reading and spelling, and were also observed to generalize their morphological knowledge to new words. Based on the findings, the researchers recommend that spelling and word study lists revolve around commonalities in morphology rather than themes or random lists of words (Kirk and Gillon, 2009).

The Center on Instruction has a publication titled, "Why Teach Spelling?" (Reed, 2012). While phonemic spelling is based on encoding single sounds, morphemic spelling looks at meaningful parts of language (prefixes, root words, and suffixes). Knowledge of morphemes and the rules to adding morphemes aids students in both reading and writing. There are rules when working with multisyllable words with affixes. Reed (2012) agrees with Goodwin, Gilbert, & Cho (2013) that there is not one specific way to teach spelling. To increase student proficiency, instructors need to make immediate corrections of errors.

Prior to explicit instruction in morphological knowledge, students should demonstrate proficiency in orthographic knowledge. Orthographic knowledge results from what students learn in phonemic awareness and phonics. It is "knowing what letters and/or symbols can represent sounds and in what combinations" (Reed, 2012, p. 32). Students will also learn morphological knowledge which Reed (2012) says is "knowing

the meaningful units within a word, how they can be combined, and how they are spelled" (p. 32). In a JW class the rules for adding prefixes and suffixes are taught from Unit 4 through the end of the program (Wilson, 2009).

High frequency/sight words. High Frequency words, also known as Sight Words are the words found most often in print. Frequently these words are not phonetically regular, although they can be. The most important aspect of these words is that because they are so numerous in text, students need to automatically recognize them. Decoding strategies learned in phonemic awareness and phonics do not apply, so if students do not know the word they may try to use knowledge that will not help them. In the JW program, these words are presented as words to be memorized. Some students with strong visual memory skills will excel in learning these words. However, many students with reading difficulties have typically not developed either reading or writing skills for high frequency words (Wilson, 2009).

Fluency

The NRP (2000) identified fluency as a necessary skill for reading comprehension. Malmgren and Trezek (2009) summarize reading fluency as the ability to read words "accurately, quickly, and with proper expression" (p. 3). Fluency is such an important part of reading because by developing automaticity with the combination of decoding words and reading high frequency words, the student's working memory is freed up to pay attention to the actual meaning of the text (Marchand-Martella et al., 2013b). Royer et al. (2004) describe skilled readers as reading with precision and without effort. As mentioned in the Phonemic Awareness and Phonics section of this paper, it was

the combination of phonemic awareness/phonics instruction with rapid reading skills that resulted in the highest gain in the adults with little to no literacy (Royer et al., 2004).

Mellard, Anthony, and Woods (2012) addressed reading fluency by just reading rate (number of words read orally per minute). This is a more objective piece of data. It does not have the rating scales of reading prosody or reading expression like other studies (Klauda and Guthrie, 2008 and Marchand-Martella et al., 2013a). In the Mellard et al. (2012) study of adults with low literacy skills, out of high school, without a diploma, they established seven components of reading that are correlated with the oral reading fluency scores of the Qualitative Reading Inventory-5 (QRI-5) and Gray Oral Reading Test (GORT). The seven reading components are: Word reading efficiency, vocabulary, auditory working memory, processing speed, phonemic decoding, phonemic awareness, and Non-verbal IQ. The results of the study found Word reading efficiency to be the strongest predictor of oral reading fluency. However, if oral reading fluency was within average limits and comprehension was poor, processing speed was the reading component to view. Overall it is the relationship with the text that impacts oral reading fluency (Mellard et al., 2012).

To assist students in increasing reading fluency, Marchand-Martella et al. (2013b) list six activities: (a) track progress, (b) listen to models of fluent reading, (c) self-monitor progress, (d) read passages at independent reading level with known vocabulary, (e) read more difficult passages over time, and (f) read passages over and over, expecting teacher feedback. As students practice these activities, especially repetition of reading passages, they can expect to increase their oral reading fluency (Marchand-Martella et al., 2013b).

Another oral reading fluency activity is to have students participate in readers' theatre (Goering and Baker, 2010). While this can be a highly effective strategy for building fluency, the teacher needs to properly engage the students to make it fun. At times, adolescents are reluctant to read aloud in front of their peers. However, some high interest/low readability products are available commercially that may enhance student fluency. The repeated reading of parts is known to have a positive effect on oral reading fluency (Goering and Baker, 2010).

Klauda and Gutherie (2008) observed 278 fifth graders and looked at the oral reading fluency of single words, syntactic units, and whole passages. As noted before, the high correlation of reading fluency with comprehension has repeatedly been found to be true. This relationship between fluency and comprehension is similar to the riddle, "What came first, the chicken or the egg?" In some cases the correlation varies based on the overall reading skills. For strong readers, comprehension may facilitate word identification, but for poor readers with limited word identification skills, they may not have good fluency or comprehension.

The study's (Klauda and Guthrie, 2008) findings report that fluency predicts comprehension and comprehension predicts fluency. Again, as the automaticity of reading increases allowing for accurate and rapid word recognition, the working memory has less to do and can focus on the understanding of the text being read. Following intervention activities as described above for all three levels of reading fluency, students exhibited improvement in both fluency and comprehension.

The definition of oral reading fluency for Klauda and Guthrie (2008) is different from Mellard et al. (2012). Klauda and Guthrie (2008) view oral reading fluency as more

than just the number of words read in one minute. They describe it as an overall expressiveness. Students with strong expressive ratings can read an entire passage with "proper stress, pitch changes, pause structure, and rhythm that was consistent with the author's apparent intent" (p. 20). By processing text at this high level, comprehension is almost always ensured.

Paige, Rasinski, and Magpuri-Lavell (2012) extend the definition of reading fluency to include automaticity, phrasing, volume, and pace. These aspects made up the Multidimensional Fluency Scale. High School students read on grade level passages and were rated on their fluency. They also completed a reading comprehension assessment. Results indicated a relationship between these two very important reading skills. As a student scored lower on the fluency scale, he/she also scored lower in reading comprehension.

In the JW program, oral reading fluency is a regular part of each unit. For fluency activities, JW uses four levels which is one more when compared to Klauda and Guthrie (2008). The four levels are word, phrase, sentence, and passage. As students complete phonemic awareness/phonics and word study, these concepts and vocabulary are incorporated in the oral reading practices that students complete individually, with partners, and at home prior to reading for the teacher. The weekly fluency activity also has a few comprehension questions that assist in monitoring both building blocks. As motivation, students track their individual progress in their notebooks (Wilson, 2009).

Vocabulary

There are approximately 290,500 words in the Oxford English Dictionary. When all possible derivations are added, that equals one million words with more words added

each year (Wilson, 2009). It is overwhelming to imagine learning all of those words much less teaching them. However, in daily literacy experiences across a school setting only a fraction of the words are used. The words that students with reading difficulties have problems learning in the content courses are the words that are the concern of the teachers.

According to the NRP (2000), an oral or written word recognized by speaking or listening is what makes up vocabulary. It is the words we use to effectively communicate to others. Vocabulary may be organized in a variety of ways. NRP (2000) divides vocabulary into oral and print. Beck, McKeown, & Kucan (2002) describe vocabulary as falling into one of three tiers. Tier one vocabulary consists of the basic words used, like: father, son, family, or teacher. Tier two vocabulary are the words used to create a richer, more descriptive or precise meaning, like: typical, function, complex, or process. Tier three vocabulary is learned in content specific classes. These words would not typically be found in other content areas. For example, a few tier three words used in a biology class are: mitochondria, chromosome, tibia, or coagulate.

In teaching vocabulary there are a vast number of strategies and activities for students of all ages. Traditional strategies to teach vocabulary can be described as "assign, define, and test" (Bromley, 2009). Students would practice through repetition and study long enough to remember the words for the test. The style of teaching just to cover information is inadequate in a 21st century classroom (Kolis & Dunlap, 2004). Marchand-Martella et al. (2013a) recommend the word-learning strategies of context clues and reference aids. Fisher and Frey (2008) describe a more intentional model to teach vocabulary. This model allows time for the teacher and students to develop an in

depth knowledge of words. The benefit is a multilayered understanding of a word that is important to know in order to comprehend oral or written communication.

Bear and Templeton (1998) discuss the many layers of meaning required to achieve the deep word knowledge students need in order to "own" a word. To "own" a word is to be able to spontaneously and independently use a new word in speaking and writing. As described in the Orthography and Morphology section of this paper, the influence of root words, prefixes, and suffixes has an impact on learning vocabulary and helps them "own" words.

Besides multi-layers of meaning, Bromley (2009) describes word learning as multidimensional. She lists three challenges for teaching vocabulary to secondary students: (a) flexibility, (b) creativity, and (c) engagement. In the challenge to be flexible, teachers should model their thinking aloud as they demonstrate to students how they arrived at meaning. Also, flexibility allows for instruction not only in a variety of strategies but at a variety of times. It is not necessary to always teach vocabulary before working with the text. Before, during, or after reading are all possible times to work on the explicit vocabulary instruction.

Bromley (2009) explains creativity as finding new and exciting ways to interact with words. When the teacher is excited about learning vocabulary, the students may become excited as well. Activities using creativity provide opportunities for students to access their prior knowledge and to think about their thinking which is metacognition. Engagement brings the learning experience together. While it can be a challenge to keep students interested and working on a task, the challenge is to find the activities, partnering, and interactions that students enjoy (Bromley, 2009).

The strong positive relationship between vocabulary and comprehension is often used to identify readability of text. Another technique is the labeling of words as "easy" or "difficult", which is subjective, and then determining the frequency of each type. Thirdly, just word count determines a book's readability. While these efforts have led to rough guidelines for labeling text level, each has ignored the actual vocabulary knowledge of the individual student. The vocabulary knowledge is the factor that best predicts readability for a student (Stahl, 2003).

Knowing the definition of a word (dictionary definition or modified language definition) may not be sufficient when determining if it has been learned. Stahl (2003) reports that when the student knows how a word is used in various contexts and can talk about how the word is used, then this indicates ownership of the word and its transfer to long term memory. This supports the idea that learning vocabulary needs to be an experience over time of learning the definition and context(s) of a new word (Marchand-Martella et al., 2013a).

Ellery (2009) and Ellery and Rosenboom (2011) wrote vocabulary chapters about teaching and reading in two different books. The vocabulary chapter in the first book, "Creating Strategic Readers: Techniques for Developing Competency in Phonemic Awareness, Phonics, Fluency, Vocabulary and Comprehension" (Ellery, 2009) describes eight strategies and techniques for teaching vocabulary to young children. The second book, "Sustaining Strategic Readers: Techniques for Supporting Content Literacy in Grades 6-12" (Ellery and Rosenboom, 2011), provides strategies and techniques for supporting a comprehensive vocabulary program to increase student comprehension of content material. Both books have excellent and practical ideas for immersing students in

the meanings and contexts of the vocabulary needed to be successful in content area courses.

Some of the strategies and techniques include: associating, contextualizing, categorizing, visual imagining, analyzing, word awareness, wide reading, and referencing (Ellery, 2009). Implementing the strategies takes time for both students and teachers. Stahl (2009) states "words are learned incrementally over multiple exposures (p. 69) and the activities need to be authentic and purposeful to accomplish the goal of learning vocabulary. Several of the strategies will be discussed in the Brain Targeted Teaching Strategies section of this paper.

In the JW program (Wilson, 2009), there is a set process for learning new vocabulary. It is the expectation that this process will be transferred to the new vocabulary the student is learning in other classes. Besides the High Frequency/Sight Words, each unit introduces at least four "Demonstration Words". These words are tier two words that exemplify the skills being learned in that unit. Each student has a Student Notebook with a section specifically for Demonstration Words that is set up to complete for all of the words in all fourteen units. The skills include: phonemic awareness, phonics, morphologic, or orthographic knowledge. The first step involves hearing and reading (receptive vocabulary) and speaking and writing (expressive vocabulary) of the new word. Second, a student friendly definition is presented. Third, students volunteer a variety of meaningful sentences using the new word. Finally, students sketch a picture representing the meaning of the new word. Since adolescents are reluctant to draw, Hardiman (2012) suggested using the term "sketch" when asking the students to add the picture to represent the meaning. This has greatly increased student participation in the

final step of getting information about the word in their student notebooks (Wilson, 2009).

Comprehension

There are many definitions of reading comprehension. A basic definition captured by NRP (2000) talks about understanding the written word and constructing meaning of the text. Reading comprehension is more than just reading words from a page, it is a purposeful and active process the reader engages in to understand and use the information for a variety of purposes. Besides reading for academic reasons, reading can be for social or pleasurable purposes as well. Sweet and Snow (2003) define reading as "extracting and constructing meaning (p.1). This definition emphasizes both the importance of the skills involved in reading the words and the ability of the reader to make meaning from the text as well.

The title of Cris Tovani's book, "I Read It, But I Don't Get It" (2000) expresses how many teachers feel when working with adolescents and text dependent content knowledge. Marchand-Martella, et al (2013b) define comprehension as the ability to read and understand the print on the page but this is all facilitated by word study, fluency, and vocabulary. Since high school students are expected to read on grade level text in a variety of subjects and across genres, successful comprehension is essential for academic achievement.

Allington (2006) distinguishes between two types of comprehension. There is the comprehension for traditional school tasks and then there is "thoughtful literacy". "Thoughtful literacy" such as analyzing, evaluating, and creating, is the understanding that achieves the higher levels of thinking in the revised Bloom's taxonomy.

While comprehension is a tremendously important topic, it is not a significant part of the Just Words program (Wilson, 2009). Like the title of the program says, the focus is on the skills required to learn how to read accurately and fluently. Part of the unit activities is teaching students how to "scoop phrases". This strategy begins with short phrases and advances to sentences and then to passages 1-2 pages long. Through much modeling the teacher helps students to move through the levels to read fluently with appropriate prosody. Students often want to read a text as fast as possible to just get through it. By repetition and frequent modeling, the students eventually read lengthy sentences with appropriate phrasing and prosody. Following the unit fluency assessment, the students are asked two or three comprehension questions. This is to help the teacher monitor the impact that increased fluency is having on student understanding.

Brain Targeted Teaching Strategies

Advances in the technologies that allow examiners to view the brain while the person is awake and completing tasks have caused untold excitement across all areas of interest and in particular, education. As a result, an entirely new field began to develop - Neuroeducational Research (Howard-Jones, 2010). Unfortunately throughout the 1990's several neuromyths developed. Both educators and researchers have written extensively about neuromyths hoping to teach others about the falseness of these unsupported claims supposedly proven by neuroeducational research (Howard-Jones, 2010).

Pera (2014) agrees that teachers are often drawn to the neuromyths but that is why cognitive neuroscience and education need to continue providing accurate information based on research. Pera reports that a good working memory is the one skill that enables a student to be successful. However, successful teachers should move away from content

and teach cognitive functioning since the brain learns best when discrete skills or details are taught within a meaningful context.

Teachers and school administrators are always looking for the next great theory or practice to implement so all students will "magically" test as advanced on state level examinations (McCall, 2012). However, the level of neuroeducational research available at this time will not be the magic answer. In fact, Howard-Jones (2010) makes a point that information and data examined in isolation is not meaningful. He says, "A science of teaching and learning which is chiefly based on the brain is unlikely to develop in the foreseeable future, . . ." (p. 194). So instead of examining one research field apart from another, it is time to blend information and perspectives from both neuroscience and education. While technology has advanced greatly, it is still not at the level to dictate pedagogy.

Radin (2009) completed a qualitative study to determine what information from neuroscience does naturally fit in with effective teaching practices. In Part I of the study, Radin (2009) listed characteristics of brain-compatible instruction in an enriched classroom environment: (a) emotional involvement by teachers and students, (b) physical setting, (c) decreased stress and potential for stress, (d) variety of classroom experiences, and (e) challenging authentic work. In conclusion, Radin (2009) put forth that for students of all ages to experience their best possible learning, they need to be in classes with teachers who have incorporated these brain-compatible teaching strategies.

Neuroimaging studies of students with dyslexia do show differences from their typical reading peers (Goswami, 2010). It has been established from brain imaging studies that reading begins with phonological processing. Students with dyslexia show

"selective under-activation of key phonological areas of the brain" (Goswami, 2010. p. 17). Fortunately reading interventions with phonology-based methods do improve these students' reading abilities (Shaywitz & Shaywitz, 2007). In Hruby and Goswami (2011), they report that with this knowledge phonology-based reading methods as well as other neuroscience findings, teachers are able to create classroom contexts for students to develop increased capacities for reading and the advanced academic skills requiring reading.

Brain Targeted Teaching Strategies (BTTS-1)

Hardiman (2003) describes six BTTS. In this study only the first three were strategically implemented with the treatment group.

BTTS-1 is about the emotional climate of students and teachers in a classroom (Hardiman, 2003). In today's world many people feel a tremendous amount of negative stress. Neuroimaging studies "reveal significant disturbances in the brain's learning circuits and chemical messengers when subjects are studied in stressful learning environments" (Willis, 2006, p. 58). While in one breath this finding may seem like commonsense, but after a moment one realizes what a huge bombshell of information has just been given to educators. The teacher needs to not only modulate his/her level of stress but also monitor the students' levels of stress. For some students not having a pencil or forgetting homework can create stress that will interfere with most or all of the new instruction that takes place during a class. Hinton, Miyamoto, and Della-Chiesa (2008) recommend restructuring the learning environment in order to minimize negative stress.

Besides stress, other emotions impact the climate of the classroom. Sousa (2010), Hinton et al. (2008), Willis (2006), and Hardiman (2003), all discuss the importance emotions have on learning. By creating a setting with positive emotions, students are better able to achieve expected learning objectives. Teenagers are going through significant developmental changes during this stage of life and the difficulties they experience come with them to the classroom. Knowledge of school issues and specifically student concerns is valuable when working to create a positive climate for these students.

Two other approaches for working with adolescents are to build up their confidence and increase their sense of feeling connected to the group (Willis, 2006). Adults learn how to put emotions aside in order to focus on the learning task. However, adolescents have not reached this level and most times the unrelated emotions they experience weaken their ability to learn (Sousa, 2010).

The BTTS for setting the emotional climate of the classroom that were utilized in this study include: predictable routines, teacher initiated trust and acceptance as well as trust and acceptance expected by students, safe environment, student control over some important instructional decisions, music and art, and opportunities to celebrate significant student accomplishments or just as a surprise (Hardiman, 2003).

Brain Targeted Teaching Strategies (BTTS-2)

The second BTTS concerns the physical environment of the classroom (Hardiman, 2003). Each high school building is different but they all have classrooms. Classrooms come with or without windows and usually fluorescent lighting. Typically

teachers have little control over the physical environment of the classroom and this is especially true when the classroom is shared by four different teachers each day.

Having a positive physical environment is a natural extension from the first BTTS of creating a positive emotional climate. One way to create a positive physical environment is through novelty. Novelty can be in seating arrangements, groupings, work posted on the walls, and an ever changing Word Wall. The environment can also be relaxed with additional furniture or carpet space (Caine, Caine, McClintic, and Klimek, 2009 and Hardiman, 2003).

The following BTTS in creating the learning environment were utilized in this study: classroom cleaning and organization routine, current work samples hanging on the walls, scented oil, flexible seating arrangements, soft background music playing during the warm-up, and open learning space to facilitate movement around the room (Hardiman, 2003).

Brain Targeted Teaching Strategies (BTTS-3)

BTTS-3 is designing the learning experience. In order to organize an upcoming unit and give students the "big picture", a concept map is developed by the teacher for the students (Hardiman, 2012). The concept map aids student's active prior knowledge about a topic and cause them to begin to wonder about what new information they will be learning that week or in that unit. Hardiman (2012) reports students with reading difficulties have a greater need of activating prior knowledge in order to have something to hook new information to. As each new idea is presented, the teacher refers the students to where it is on the concept map. At the end of the unit and prior to the assessment, it is helpful to review the concept map to show the students just how much they have learned.

In designing learning experiences it is helpful for the teacher to complete global planning. This type of planning takes the overall content along with the learning objectives to develop lessons and activities which will lead to student learning (Hardiman, 2012). The lessons and activities become ways for the students to become engaged in the curricular concepts. The variety of learning experiences is endless. Being creative and responsive to student interests makes the engagement fun and meaningful to both students and teachers.

Some of the BTTS-3 incorporated in designing the learning experience include: concept maps – one for each unit, visual representation of learning objectives, alternative forms of assessment, rubrics for literature-based activities, visual representations in reading journals of meaning from selected sections of text (Hardiman, 2003).

Conclusion

While the reader may be tempted to think, "Shouldn't adolescents already be literate?" (IRA, 2012, p.3), the truth is NAEP scores in reading and writing are still low. The IRA Adolescent Literacy Position Statement (2012) lists eight principles that all literacy programs for adolescents should include. Specific to this paper are: "#2 Adolescents deserve a culture of literacy in their schools and a systematic and comprehensive programmatic approach to increasing literacy achievement" (p. 6) and "#4 Adolescents deserve differentiated literacy instruction specific to their individual needs" (p. 8).

The ultimate goal of reading is to be able to make meaning of text to use in a variety of ways; both academic and social. As adolescents move through high school, they begin to need literacy skills to be successful in the workplace. Having the ability to

read, make sense of what you read, and then apply that information is what determines how successful a student will be upon graduation.

Since the End of the Study

Six months have passed since this study ended. In that short amount of time the implementation of the Common Core Curriculum (CCC) has become the daily expectation for the classroom teachers. Forty-three states, the District of Columbia, and four territories have adopted the CCC and are at different levels of implementation. Maryland has embraced the CCC and has the curricular expectations posted on its website for teachers to access. The first round of the Partnership for Assessment of Readiness for College and Careers (PARCC) tests were administered in December 2014. The reading and writing assessment expectations exceeded any test the high school students had previously encountered. Students were required to read on-grade level text and complete multiple choice questions and essays using the highest levels of thinking – creating, evaluating, and synthesizing.

Teachers have had some staff development but are mostly under prepared to instruct students in completing close analytical reading tasks and finding text-based evidence to support their answers. In Maryland, teachers are required to take two classes in Reading and currently, neither course addresses the higher levels of reading, thinking, and writing demanded by CCC and the PARCC.

Chapter 3: Method

This section will present the method for this study.

Participants

Students. To be eligible for participation, students (a) scored below an 800 Lexile on the Scholastic Reading Inventory (SRI), (b) recommended by English/Language Arts teachers for remedial reading, and (c) be high school students. Most of the students have an Individual Education Plan (IEP) but that was not an eligibility criteria.

Instructor. The primary investigator of this study was the instructor. The investigator has taught for over 30 years in four different states. She is certified as a Speech-Language Pathologist, Special Education Teacher, and Administrator II. The school district's Reading Interventionist Specialist has trained the instructor in the Wilson Reading Program, Wilson Reading Comprehension, Wilson Foundations, and Wilson Just Words.

Setting

North County[1] Public Schools is a suburban district in Maryland that enrolls over 27,000 students in 44 schools. There are approximately 1,300 teachers in the county. The North County High School is located in the county seat. It has over 1,700 students served by 110 staff; 80 of which are teachers. The graduation rate is greater than 95%, however, it is difficult to gauge the rate for subgroups. Depending on the year, the number of students in a subgroup may not be statistically significant.

[1] North County Public Schools is a pseudonym.

Table 1

Descriptive Statistics

	Treatment N%	Control N%	Total N%
Gender			
Male	57.1	33.3	43.75
Female	42.9	66.7	56.25
Grade			
9	57.1	55.6	56.25
10	42.9	33.3	37.50
12	0.0	11.1	6.25
Disability Code			
504	14.3	0.0	6.25
Speech Language	14.3	22.2	18.75
Emotional	0.0	22.2	12.50
Other Health Impaired	14.3	11.1	12.50
Specific Learning Disability	57.1	44.4	50.00

Materials

Instructional material for all participants is the Just Words program. Just Words is published by the Wilson Language Training Corporation (2009) for word level deficits. The original intervention program is the Wilson Reading System published in 1988. It is a research-based, small group instructional program for students and adults who require intensive intervention. Due to the highly intensive nature, as many as two to three years of 60-90 minute sessions are needed to complete the program. There are settings, like a high school, when this program is rarely feasible due to credit earning and staffing of highly qualified staff.

Just Words (JW), a condensed and accelerated version of the Wilson Reading System, was piloted in the 2008-2009 school year and published for use beginning in 2009. As the title of the program describes, the focus is on decoding words (Word Study including Phonemic Awareness and Phonics). There is also a fluency building component but not comprehension. The 14 Units along with two Bonus Units are designed to be taught to students in grades 4-12 and adults in groups up to 15 in 45 minute sessions over one entire school year. Since the North County High School operates on a four mod day, with class periods lasting 80 minutes, the material can be covered in one semester. In order to complete all 14 units in one semester, a unit will be completed in one week instead of two. With the decreased time and larger group sizes (when compared to the Wilson Reading system), high school administrators have elected to implement Just Words as a viable research-based program for students who read significantly below grade level.

Variables

Independent variables. The Independent Variable (IV) for this study is the teaching strategy used to deliver the Just Words program; (a) the Just Words delivery model, and (b) the Brain Targeted Teaching Strategies (BTTS) + the Just Words curriculum. The control group will be instructed in the Just Words program as it is written in the manual. The need to connect research to effective instruction has been a goal of many educators. The Brain-Targeted Teaching Model (BTTM) developed by Dr. M. M. Hardiman (2003) accomplishes this goal. In this study three brain targets (BT) will be considered while planning, executing, and reflecting on lessons. There are six total brain targets described by Hardiman (2003, 2012), but only three have been selected as the focus for this study.

In the Brain-Targeted Teaching Strategies (BTTS) Hardiman (2003, 2012) has identified six neuro-educational experiences related to student learning. This study will focus on the first three strategies (emotional environment, physical environment, and designing the learning experience). The other three BTTS are: teaching for declarative and procedural knowledge, teaching for extension and application of knowledge, and evaluating learning. The first BTTS is developing the climate of learning for the students' emotional environment (BTTS-1). If the brain is experiencing stress, it is less able to learn. Teachers need to create a positive classroom setting that supports student learning. In this study the emotional levels of the students will be informally assessed each day and throughout the introduction of new material. Time for personal conversations will be allotted in order to develop teacher student relationships. Exercises for reducing stress will be practiced and then performed prior to unit assessments. Other

important strategies to address the emotional climate of the classroom include: predictable routines, a safe environment for all students to be willing to share and take risks, opportunities for student choices, use of humor, the arts, and time for celebrations.

While BTTS-1 deals with the emotional environment, BTTS-2 looks at ways the physical environment can support student learning. The classroom climate and physical environment are easily overlooked in designing instructional plans. BTTS-1 and BTTS-2 are reminders of where to begin when planning educational best practices. Hardiman (2003) lists a variety of strategies to manipulate the physical environment. Some of these techniques include: using scented oil, playing background music, flexible seating arrangements, displaying student work, modifying harsh fluorescent light, and making the environment as comfortable as possible. All of these strategies will be utilized with the Treatment group.

Once the emotional and physical settings are established, the teacher designs the learning experience (BTTS-3). Students are bombarded with input through all of their senses. The teacher creates an instructional plan for the learning experience that maximizes students' prior knowledge linkage to the new learning. One way teachers can create the big picture of a unit of study is through concept maps. This helps satisfy students' needs for making meaning and determining relevancy. At the beginning of each unit, the teacher will create a concept map that outlines the desired learning outcomes. Daily objectives will also be posted and reviewed at the beginning of class. The Just Words program has a Scope and Sequence as well as lesson plans for each day.

Dependent variables. Four Dependent Variables (DV) will be used in this study to assess student academic gains and participant satisfaction. The four Dependent

Variables are: (a) The Scholastic Reading Inventory score (SRI), (b) the Word Identification and Spelling Test (WIST), (c) Test of Silent Word Reading Fluency (TOSWRF), and (d) the results of the survey from each student.

The Scholastic Reading Inventory (SRI) is an easy to administer, computer based assessment that reveals students' reading Lexile's and shows change over time. At North County High School it is administered to all ninth and tenth grade students at the beginning and end of each school year. In addition, the North County Middle School shares its SRI data with the high school. Conferences between administration, reading teachers, and special educators resulted in a decision to include students with Lexile scores below 800 in the Just Words intervention unless their decoding skills were documented to be significantly higher than their reading comprehension.

Part of the Wilson Just Words identification and placement process includes two individual assessments, the Word Identification and Spelling Test (WIST) and Test of Silent Word Reading Fluency (TOSWRF). The WIST (Wilson & Felton, 2004) is used to diagnose students' basic literacy skills. It was nationally standardized on a sample of 1,520 children from 16 states. Using the coefficient alpha, test-retest, and interscorer differences were calculated to determine reliability. The summary of the reliability results indicate 22 of the 24 coefficients met or exceeded the standard of .95. Validity test results for the WIST are reported as preliminary. However, the researchers state they have provided sufficient evidence to confidently use the word identification and spelling scores.

The TOSWRF (Mather, Hammill, Allen, & Roberts, 2004) was normed with a sample of 3,592 children from 34 states. Using a three minute timed format, students read

as many words as possible to determine student reading skills levels. The four types of reliability investigated include: alternate form (immediate), test-rest, alternate form (delayed), and interscorer differences. Results reveal the TOSWRF is reliable at or above the .90 standard. As with the WIST, the researchers report the validity results as preliminary. Based on correlations between the Wechsler Intelligence Scale for Children Third Edition (WISC III) and WIST, as well as predictive outcome validity, the TOSWRF is a valid measure of student reading fluency and general reading ability.

Procedure

Eligible students were enrolled in a one semester Reading course, either Fall 2013 (Cohort 1: JW only) or Spring 2014 (Cohort 2: BTTS + JW). Students were conveniently enrolled based on their overall school schedules. For example, some students were able to enroll in semester one but not semester two. The course lasted for 80 minutes daily for 18 weeks. During the first two weeks of the school year all participants (both Cohort 1 and Cohort 2) underwent baseline testing using the Wilson assessments (WIST and TOSWRF) aligned with the Just Words program (see Figure 1). For Cohort 1 receiving only the Just Words curriculum (JW), at the beginning of the intervention semester, the students received Just Words individual portfolio packets with three workbooks, Wilson magnetic journals, and dry erase boards. Teaching of the Just Words program lasted 14 weeks, allowing one unit per week. The two Bonus Units' materials were incorporated within the established curriculum. During the last two weeks of the semester, when the Just Words program was finished, post testing (WIST and TOSWRF) was completed for Cohort 1 (Just Words alone) along with a student survey.

Cohort 2 (BTTS + JW) were enrolled in other classes during the first semester, Fall 2013. At the beginning of the second semester, Spring 2014, all participants were assessed again. This allowed a baseline prior to the Just Words instruction. Cohort 1 students then enrolled in other classes for semester two. All participants from Cohorts 1 and 2 were tested again, prior to the end of the school year using the WIST and TOSWRF.

August 2013	January 2014	June 2014
• Cohort 1 begins Just Words Reading semester • Cohort 2 enrolls in other classes • All students complete WIST, TOSWRF, SRI	• Cohort 1 ends Just Words Reading semester and completes Survey • Cohort 2 begins Just Words Reading semester • All students complete WIST, TOSWRF, SRI	• Cohort 1 ends semester 2 class • Cohort 2 ends Just Words Reading semester and completes Survey • All students complete WIST, TOSWRF, SRI

Figure 1. Timeline of instruction and testing for 2013 – 2014 school year.

Just Words is a scripted decoding program that includes opportunities for fluency, vocabulary, and comprehension skills as well. The focus of this dissertation is to strengthen word level deficits in high school students, reading below grade level. Cohort 1 was instructed in Just Words as it is written in the manual (see Appendix A for the course outline). Cohort 2 was instructed in Just Words following the same sequence of instruction while strategically implementing the three Brain Targeted Teaching Strategies.

Cohort 2 students had the opportunity to select from an Activity List as outlined in the lesson plans each day. The list included a variety of activities to process, store, and retrieve information. Some Activity List items included working with different mediums like play dough, scented markers, and dry Jell-O. (See Appendix B for the course outline). BTTS encourages teachers to pair nonlinguistic representations with left-brain language tasks, resulting in increased student learning of the designated curriculum.

The purpose of a survey is to learn information about the students' level of satisfaction and engagement regarding their engagement in the class. An engagement survey was developed and then administered at the end of the semester the student enrolled in Reading. See Appendix C for a sample of the survey.

Design and Analysis

The design of this study is a time lag panel design with two cohorts. The goal was for each cohort to have approximately ten students. Cohort 1 took the Reading class (Just Words Intervention) during the fall semester while Cohort 2 was enrolled in other classes. During the spring semester, Cohort 2 received the Just Words Intervention while Cohort 1 was enrolled in other classes. Both groups were assessed three times: at the beginning of the school year, in the middle of the school year, and at the end of the school year. By testing each of these times, it allowed the comparison of baseline data and comparisons between groups. The engagement surveys were only administered at the end of the Reading course for each cohort.

This study is quasi-experimental with a time series design. There are control and treatment groups and four dependent variables. Three of the dependent variables (SRI, TOSWRF, and WIST) were administered three times during the course of the study: at

the beginning, middle, and end of the 2013 – 2014 school year. The fourth dependent variable (Student Survey) was administered once to each cohort at the end of the semester they enrolled in the Reading course.

Some descriptive statistics were also included, such as age, gender, race, grade, and IEP or 504 status. While the size of this study's population is very small and no generalizations can be made, it is the beginning of looking at a different teaching model that may be used across all curricular areas.

Chapter 4: Results

The purpose of this study was to determine the impact of Brain Targeted Teaching Strategies (BTTS) on students' who were learning the Just Words program developed by Wilson Language Training Corporation. Research hypotheses were stated to address the purposes of improved reading achievement, reading fluency, word identification, spelling, and fundamental literacy ability index for students in the treatment group. One other research hypothesis addressed the students' satisfaction with the Just Words Reading classes they were enrolled in. This chapter presents the results of the study for each hypothesis.

Research Hypothesis 1

Hypothesis 1 examined whether BTTS could improve standardized reading achievement for high school students reading below grade level. This hypothesis stated there will be a difference in the reading achievement scores on the Scholastic Reading Inventory (SRI) for the students enrolled in Just Words and BTTS compared with students in Just Words alone. The comparison between groups for reading achievement scores was calculated by comparing average individual slope differences for the one semester the students participated in the study. Results of a t Test for Dependent Variables indicated no significant difference between the treatment and control groups, $t(14) = 0.07$, $p > .05$. The difference between the means was 2.33 (CI_{95}: -69.53 – 74.19). See Table 2 for the means and standard deviations.

These results indicate there was not a significant difference between the posttest and the pretest Lexile slopes when the treatment and control groups were compared. The research hypothesis was not supported.

Research Hypothesis 2

Hypothesis 2 examined whether BTTS could improve reading fluency achievement for high school students reading below grade level. This hypothesis stated there will be a difference in pre- and post-reading fluency assessment scores (Test of Silent Word Reading Fluency) for the students enrolled in Just Words and BTTS compared with students in Just Words alone. The comparison between groups for reading fluency scores was calculated by comparing average individual slope differences for the one semester the students participated in the study. This hypothesis was tested using a t Test for Dependent Variables. Results indicated a significant difference between conditions, $t(14) = 2.42$, $p < .05$. The difference between the means was 5.81 (CI_{95}: 3.33 to 9.14). See Table 2 for the means and standard deviations.

These results indicate that the treatment group was better able to identify single words on the TOSWRF than the control group. The research hypothesis was supported.

Research Hypothesis 3

This hypothesis examined whether BTTS could improve word identification, spelling, and/or fundamental literacy scores for high school students reading below grade level. There will be a difference between groups comparing pre- and post- (3.1) word identification assessments, (3.2) spelling assessments, and (3.3) fundamental literacy ability indexes (Word Identification and Spelling Test). The comparison between groups for each of these three scores was calculated by comparing average individual slope differences for the one semester the students participated in the study.

Research hypothesis 3.1 stated there will be a difference between the slopes of the control and treatment groups in their ability to identify words on the WIST. Results of a t

Test for Dependent Variables indicated no significant difference between groups, $t(14) = 1.14$, $p > .05$. The difference between the means was 4.15 (CI_{95}: -3.367 – 11.98). See Table 2 for the means and standard deviations.

These results indicated there was not a significant difference between the pre-test and post-test slopes of the control and treatment groups. The research hypothesis was not supported.

Research hypothesis 3.2 stated there will be a difference between the slopes of the control and treatment groups in their ability to spell single words on the WIST. Results of a t test for dependent variables indicated a significant difference between groups, $t(14) = 3.14$, $p < .05$. The difference between the means favored the control group; the difference between the means was -5.75 (CI_{95}: 4.43 – 23.63). See Table 2 for the means and standard deviations.

Results indicated there was a significant difference between the pre-test and post-test slopes of the control and treatment groups. The control group scored significantly better on the spelling assessment compared to the treatment group. The research hypothesis was supported.

Research hypothesis 3.3 stated there will be a difference between the slopes of the control and treatment groups in their fundamental literacy ability on the WIST. Results of a t Test for Dependent Variables indicated no significant difference between groups, $t(14) = 0.08$, $p > .05$. The difference between the means was -5.75 (CI_{95}: -6.51 – 7.01). See Table 2 for the means and standard deviations.

These results indicated there was no significant difference between the pre-test and post-test slopes of the control and treatment groups. The research hypothesis was not supported.

Research Hypothesis 4

Hypothesis Four examined four areas of student preference with a survey through four sub-hypotheses: (4.1) program satisfaction, (4.2) use of decoding strategies, (4.3) grouping for learning, and (4.4) student comments. Responses from students enrolled in Just Words and Brain Targeted Teaching Strategies were compared to student responses from Just Words alone, hypothesizing more favorable responses from students who experience Brain Targeted Teaching Strategies.

Research Hypothesis 4.1, the survey, asked students to rate ten statements on a Likert scale of one to five; one indicated "Strongly Disagree" and five "Strongly Agree". The ten statements were analyzed using SPSS Chi-Square analysis. Results of chi-square analyses indicated one significant difference between groups for responses. The control group rated Statement 8, "Mrs. E. helped me feel good about myself as a learner", higher than the treatment group. Scaled responses for each item are shown in Table 3. There were no other significant differences.

Research Hypotheses 4.2, the second section of the survey, addressed seven decoding strategies taught in Just Words. The question asked which new strategies the students reported they were using. Students answered "yes" they have used the strategy or "no" they have not used the strategy. The students' reports of their use of the seven strategies were analyzed using SPSS Chi-Square analysis. Results of chi-square analyses indicated some significant differences between groups for responses. Significant

differences were found for the following strategies: Sound out by Syllable Type, Latin Roots, and Scooping Phrases. Scaled responses for each item are shown in Table 4. All of the Control participants (100%) reported using the strategies of Syllable Types and Scooping Phrases compared to 57% of the Treatment participants. Additionally, 57% of Treatment participants reported using the strategy of Latin Roots compared to 11% of Control participants. There were no other significant differences.

Research Hypotheses 4.3 addressed the type of setting the students preferred when receiving new information. The choices were: whole class, reading groups, partners, or individual/alone. None of the experimental students selected whole class, two selected reading groups, one selected with partners, and four selected individual/alone. The control group responded as follows: three whole class, one reading groups, three partners, and one individual/alone. SPSS Chi-Square analysis was used to compare groups on this variable. The chi-square analyses indicated no significant differences between groups for responses. Results for this question are shown in Table 5.

Research Hypothesis 4.4 examined student opinions, comparing the groups. There were two free response questions. The first asked, "How could Just Words reading intervention class improve to better meet your needs?" The students listed the following:

Treatment Group	**Control Group**
• "You should have done vowels more" • "Move I made me somewhat confused" • "Just making class fun"	• "Maybe more on-on-one would have been better" • "Give us gum and candy" • "Less homework" • "Have more group things"

Treatment Group	Control Group
• "Honestly, I don't think you meet your (our) needs because it's basically like you started back in PreK" • "More words" • "Move learning quicker so we don't go over a lot of things student have already known. It helps to learn things we don't already know." • "I DONT know because I knew all of it" • "None"	• "I could use more help inside the classes" • "Went back over the words" • "Explain more easier" • "Because that made me feel special" • "More individual work"

The student responses from the Control group had an overall more affirmative tone than the Treatment group. Statements from the Control group were very positive, "I could use more help inside the classes" and "Went back over the words". Additionally, the Control group's responses were constructive criticism: student preferences for instructional settings, the need to go slower with some concepts, and the need for individual support. The Treatment group made statements that were more like complaints. For example, one student wrote "I DON'T know because I knew all of it" and "Honestly, I don't think you meet your (our) needs because it's basically like you started back in PreK" and "You should have done vowels more".

The second free response was space for the students to submit additional comments. Responses from the Treatment Group were:

- "You are a great teacher"
- "Have a great summer"
- "Good"

Only one response came from the Control Group

- "Spelling the words"

There were only four total free responses. Not much information was able to be interpreted from these responses.

Research hypothesis 4.0, interpreted from results of sub-hypotheses 4.1, 4.2, and 4.3 was not supported.

Adhoc Results: Classroom Climate

While the placement of the students in each group was random based on their academic schedule for the 2013-2014 school year, each group took on a personality that influenced their achievement. The Control Group started on the first day of school and from that day through to the very last class, they were a happy, respectful, pleasant, and easily engaged group of students. Their responses on the Student Survey support the positive emotional climate for the entire semester. This group did not have the benefit of the strategically introduced BTTS and all of the fun multi-sensory activities, but appreciated everything that was done for them (periodic treats and free time).

The Treatment students started in mid-January and continued to the last day of school. One difference with this class was that they met during the mod which has the lunch break built into the mod. They were assigned the second lunch so the students arrived to class, completed 40 minutes of instruction, left for a 30 minute lunch, and then

returned to the classroom for another 40 minutes of instruction. This disruption was not a part of the Control group's schedule.

From the very first day it was a struggle to maintain a positive emotional climate with the Treatment group participants. Specifically, there were two students out of the seven that behaved inappropriately almost every day. Their behaviors included: tardiness to class and returning from lunch, putting their head down, sneaking phone time, speaking in a disrespectful tone of voice when answering an adult, and being off-task. One student felt he was not correctly placed in the class although he read at an elementary level. Almost every day he complained about something in the class. His negativity seemed to put stress on everyone but instead of letting him drop the class, his IEP team insisted he remain. As a whole, this group was sullen, unmotivated, unengaged, and disconnected. They preferred to work alone or with the partner they selected even if it was not their assigned partner.

Table 2

Mean, Standard Deviation, and t of Dependent Variables Slope Estimates

Measure	**Mean**	**Std. Deviation**	***t* Result**
Lexile			
Treatment	50.00	69.31	$t(14) = 0.07$
Control	53.33	64.28	
TOSWRF			
Treatment	9.14	4.49	**$t(14) = 2.42$***
Control	3.33	4.95	
WIST_Word ID			
Treatment	7.29	5.28	$t(14) = 1.14$
Control	11.44	8.41	
WIST_Spelling			
Treatment	-9.14	12.59	**$t(14) = 3.14$***
Control	4.89	4.37	
WIST_Total			
Treatment	8.86	5.58	$t(14) = 0.08$
Control	9.11	6.72	

* $p < .05$

Table 3

SPSS Chi-Square Analysis Results of Comparisons Within Groups

Item	Group	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Chi-Square
		% (n)	*% (n)*	*% (n)*	*% (n)*	*% (n)*	
I like the Just Words program materials	JW + BTT	14.3(1)	14.3(1)	28.6(2)	42.9(3)	0.0(0)	1.47
	JW Alone	0.0(0)	11.1(1)	33.3(3)	55.6(5)	0.0(0)	
I like to see my good work hanging up in the classroom.	JW + BTT	28.6(2)	14.3(1)	0.0(0)	57.1(4)	0.0(0)	8.01
	JW Alone	11.1(1)	11.1(1)	55.6(5)	11.1(1)	11.1(1)	
At the beginning of the week, I understood what the learning goals would be for the new unit.	JW + BTT	0.0(0)	0.0(0)	28.6(2)	28.6(2)	42.9(3)	0.83
	JW Alone	0.0(0)	0.0(0)	33.3(3)	44.4(4)	22.2(2)	
Just Words gave me time to learn new information.	JW + BTT	14.3(1)	14.3(1)	28.6(2)	14.3(1)	28.6(2)	3.42
	JW Alone	0.0(0)	0.0(0)	55.6(5)	22.2(2)	22.2(2)	
I like Just Words lessons better than my regular classroom lessons.	JW + BTT	28.6(2)	28.6(2)	14.3(1)	14.3(1)	14.3(1)	1.1
	JW Alone	11.1(1)	44.4(4)	22.2(2)	11.1(1)	11.1(1)	
I like making choices in my learning activities.	JW + BTT	28.6(2)	14.3(1)	0.0(0)	42.9(3)	14.3(1)	5.16
	JW Alone	0.0(0)	0.0(0)	11.1(1)	66.7(6)	22.2(2)	
Just Words presented material in a way that made learning fun.	JW + BTT	28.6(2)	0.0(0)	28.6(2)	42.9(3)	0.0(0)	8.08
	JW Alone	0.0(0)	11.1(1)	33.3(3)	11.1(1)	44.4(4)	
Mrs. E. helped me feel good about myself as a learner.	JW + BTT	28.6(2)	0.0(0)	0.0(0)	71.4(5)	0.0(0)	**12.61***
	JW Alone	0.0(0)	0.0(0)	11.1(1)	11.1(1)	77.8(7)	
	JW + BTT	14.3(1)	14.3(1)	42.9(3)	28.6(2)	0.0(0)	3.23

Item	Group	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Chi-Square
		% (n)	*% (n)*	*% (n)*	*% (n)*	*% (n)*	
Just Words taught me how to remember.	JW Alone	0.0(0)	0.0(0)	44.4(4)	55.6(5)	0.0(0)	
I liked attending the Just Words class.	JW + BTT	28.6(2)	14.3(1)	28.6(2)	28.6(2)	0.0(0)	4.35
	JW Alone	0.0(0)	22.2(2)	22.2(2)	33.3(3)	22.2(2)	

*$p < .05$

Table 4

SPSS Chi-Square Analysis of Comparison of Individual Use of Decoding Strategies on Student Survey

	Group			
	Treatment		**Control**	
Strategy	**Yes n(%)**	**No n(%)**	**Yes n(%)**	**No n(%)**
1. Syllable types*	4(57.1)	3(42.9)	9(100.0)*	0(0.0)
2. Prefixes, Suffixes	4(57.1)	3(42.9)	7(77.8)	2(22.2)
3. Latin Roots*	4(57.1)	3(42.9)	1(11.1)	8(88.9)*
4. Scooping Syllables	4(57.1)	3(42.9)	8(88.9)	1(11.1)
5. Scooping Phrases*	4(57.1)	3(42.9)	9(100.0)*	0(0.0)
6. High Frequency/ Sight Words	4(57.1)	3(42.9)	7(77.8)	2(22.2)
7. Demonstration Words	4(57.1)	3(42.9)	7(77.8)	2(22.2)

* $p \leq .05$

Table 5

Student Setting Preferences for Learning New Information from the Student Survey

	Group	
	Treatment	**Control**
Setting	**N(%)**	**N(%)**
Whole Class	0(0.0)	3(33.3)
Reading Groups	2(28.6)	1(11.1)
Partners	1(14.3)	3(33.3)
Individual/Alone	4(57.1)	2(22.2)
Total	**7(100.0)**	**9(100.0)**

Chapter 5: Discussion

This study investigated the impact of strategically implemented BTTS using the Just Words reading intervention program with high school students who read significantly below grade level. Based on student schedules, the sixteen students were assigned with nine students going to the Control group and seven students to the Treatment group. The study examined data collected through pre- and post-assessments administered to each student. The first three research hypotheses examined student reading levels, silent word reading fluency, word identification, spelling, and fundamental literacy ability. The fourth research hypothesis was related to the four sections on the student survey that was anonymously completed at the end of the semester. A review of the study's major findings is provided. This chapter also describes the conclusions, implications, and limitations of the study and concludes with suggestions for future research and practice.

Major Findings

Research hypothesis one. Research Hypothesis one examined whether BTTS could improve standardized reading achievement for high school students reading below grade level. Analysis of reading achievement indicators for students found no significant difference. According to the "Scholastic Reading Inventory Implementation Guide" (2006), students at or below the 25th percentile in grades 9-12 should increase their Lexile score by 50 points in a school year. Using the 4 x 4 mod schedule which is one mod for a semester equaling a typical period over one school year, seven of the nine students (77.78%) in the Control group increased their Lexile scores by at least 50 points; yet only three out of the seven students (42.88%) in the Treatment group made a year's growth in

their SRI Lexile scores during the semester. In this study the BTTS of establishing a positive emotional climate for the treatment students was not accomplished. Many educational researchers (Allington, 2013, Haridman, 2003, Hinton, Miyamoto, & Della-Chiesa, 2008) have described the interdependence of learning and emotion. With the less than satisfactory emotional climate of the treatment class, this may be the reason why these students did not make a significant growth in reading achievement.

Research hypothesis two. Research Hypothesis two stated there will be a difference in pre- and post-reading fluency assessment scores (Test of Silent Word Reading Fluency) for the students enrolled in Just Words + BTTS when compared to the students in Just Words alone. Results indicated a significant difference between the two groups. The research hypothesis was supported with the Treatment group scoring better than the Control group on this test. This indicated the Treatment group students were able to read single words more quickly than the Control group students. The Price and Devlin (2011) study of the ventral occipito-temporal cortex explained how with practice and greater familiarization the rate of reading words increased. In particular, the occipito-temporal region is just one of three neural systems in the left hemisphere of the brain that play an instrumental role in reading fluency (Shaywitz & Shaywitz, 2007). The lessons for the treatment participants included a wide variety of visual representations of words which the control participants did not experience.

Research hypothesis three. This hypothesis was divided into three sub-hypotheses and the results from the Word Identification and Spelling Test (WIST) were analyzed using the t Test for Dependent variables. The first sub-hypothesis examined students' ability to identify words. The third sub-hypothesis examined the fundamental

literacy ability which was the sum of the two subtests (word identification and spelling). Neither the first nor the third sub-hypotheses were found to be significant. All of the students similarly increased their fundamental literacy abilities and the Just Words lessons provided opportunities for all students to practice sight words and reading words that could be sounded out. Learning the grapheme-phoneme connections along with syllable types and sight words helped the students to increase their ability to identify words.

However, the second sub-hypothesis, the spelling subtest, was found to be significant. Overall the Control group scored significantly higher than the Treatment group. This result may be due to the seriousness and engagement of the Control group to learn the Just Words curriculum. By learning the grapheme-phoneme connections, syllable types, and applying these concepts to spelling words, the Control group made significant progress.

Research hypothesis four. Four sub-hypotheses examined areas of student satisfaction, preferences, and opinions reported in anonymous student surveys administered at the end of the semester. The first sub-hypothesis stated there will be a difference in program satisfaction between the groups. There were ten statements students rated on a five point Likert scaled from Strongly Disagree to Strongly Agree. Nine out of the ten statements did not have significant findings between groups. The only statement that was significant was Statement 8, "Mrs. E. helped me feel good about myself as a learner." The Control group responded significantly more positively than the Treatment group. This could be attributed to the overall positive classroom environment

for the Control group. Each student was engaged in learning. From the beginning of the semester there was a level of "buy in" that was never achieved by the Treatment group.

The second sub-hypothesis addressed the seven decoding strategies taught in Just Words. Students were asked if they did or did not use each strategy. If they did use the strategy, they placed a check under the "Yes" column, and if they did not use the strategy they checked "No". Based on the statistical analyses, there were no significant findings related to student use of the following strategies: Prefixes/Suffixes, Scooping Syllables, High Frequency/Sight words, and Demonstration Words. The first strategy, Sound out by Syllable Type, was significant for the Control group. They all responded "Yes" to using syllable types when reading words. Using Latin Roots was also significant for the Control group but eight out of nine of the students answered "No" to using Latin Roots when reading words. The control group practiced this skill but it never seemed to make sense to them why we were learning Latin roots to help us read words. Scooping phrases was significant for the control group. All nine students responded "Yes" to scooping phrases as a strategy they used when reading.

The third sub-hypothesis was related to which learning setting did students prefer when receiving new information. There were no statistically significant results between groups. The participant groups were similar being poor readers and used to learning in similar ways by the time they reached high school. There were differences between the groups in the classroom climate which may have promoted learning in the control group and hindered learning in the treatment group for some of the indicators, but the classroom setting preference was similar between the groups.

The fourth sub-hypothesis was an opportunity for group participants to express their opinion about the curriculum. The treatment group listed comments related to the pace of the class being too slow or the curriculum being like Pre-Kindergarten. The control group's comments were constructive criticism. For example, they wanted more group activities, review of the words, repeated explanations, and more opportunities for one-on-one with the teacher.

Conclusions

Research Hypotheses Two and Three, had two statistically significant findings. The first was that the treatment group was able to read single words faster than the control group. Although the treatment group verbally expressed disdain for many of the BTTS, it was obvious that some connections were being made through learning the Just Words curriculum. By being able to read words more quickly, a student's working memory space is freed up to use for comprehension. Since comprehension is vital to academic success, this lends positive support to the benefit of BTTS helping students learn to perceive words more quickly. The benefit of being in a Just Words reading class with the intentional implementation of BTTS shows the variety of ways the brain's senses are engaged throughout the lesson. This continual activity leads to making more and more connections for the curriculum with multiple pathways that will be pruned and lead to automaticity which is essential for fluent reading.

The second significant finding favored the Control group. On the Spelling subtest of the WIST, the Control group achieved a greater score. As reported by the Student Survey, the Control group was using the "syllable type" strategy which gave the students a distinct system to learn how to spell words. While the Control participants did not have

the added, intentionally introduced BTTS, through the Just Words curriculum the students learned the grapheme- phoneme connection for consonants, vowels, syllable types, as well as sight words. These skills allowed the control students to excel at spelling.

The fourth Research Hypothesis was an opportunity to gather qualitative data from the Student Survey looking for differences between groups.

One important skill taught in the Just Words curriculum was identifying syllable types. The control group reported using this strategy and the scooping phrases strategy to increase their reading ability. The treatment group reported using the Latin Roots strategy. While the control group selected broad skills that apply in almost all text, the treatment group selected an isolated skill that will help them but not as frequently as the syllable type and scooping phrases strategies.

Theoretical Findings and Implications

Howard-Jones (2010) states, "the brain is always active everywhere". This general activity is getting better known all of the time by researchers in the field of neuroscience. Educators want to know how research findings will impact teaching and learning. Howard-Jones (2010) differentiates between the fields of neuroscience and education by describing scientific studies as giving an understanding of brain function and mental processes but this information is not ready for direct transfer to educators. Neuroscience may provide insight but it is the questioning and discussions with educators that are framing the science of teaching and learning. The joining of the fields has developed into the brain-based science of education or "Mind, Brain, Education" and

from these connections, brain targeted teaching strategies have emerged (Hardiman, 2003, 2012; Sousa, 2010; Willis, 2007).

Lebel et al. (2013) analyzed brain structures with reading activities. In adolescents and young adults, they found a common frontal network that supports reading skills like word identification, word attack, and fluency. They also saw a progression from wider reading skills like sight word reading with wider brain regions, to narrower reading skills like decoding with more narrow, focused brain regions. However, these brain regions are supported by white brain matter connectivity in both lobes. This implies both hemispheres working together to complete a variety of reading activities.

Research about learning has been important to both neuroscientists and educators. To teach students who have failed repeatedly despite a variety of interventions, begs the question, "Why?". While teachers and administrators are always looking for the next great theory to promote student achievement, the answer to the question is not that simple (McCall, 2012). It would be easy to say that learning just adds new brain cells, however, there are only certain regions of the brain that make new cells. In reality it is the connections that are being made in the brain that support the learning (Howard-Jones, 2010; Willis, 2007). Along with the connections being made and strengthened in the brain there is a degree of plasticity where the connections are not only made and strengthened, but reorganized, extended, and cut to increase automaticity (Willis, 2010). This is one of the theories of the science of learning.

The three BTTS selected for this study included: setting the emotional climate for learning, creating the physical learning environment, and designing the learning experience. When deciding which BTTS to implement, on the surface it seemed the

instructor would have the most control over the application of these three strategies. However, setting a positive, stress-free emotional climate is not one-sided. The student responses to the setting either support or weaken the instructor's efforts. High school students may come to class with chronic stress. Past negative school experiences have interfered with learning and some students are just not interested in engaging in educational activities. Secondly, the physical learning environment did not seem to be of any interest to the students. Even when novel items appeared in the room, they did not seem to notice or find them significant. Also, the classroom was shared with three other teachers so the amount of wall and table space was limited. Thirdly, the Just Words curriculum is mostly scripted with some room for flexibility. The art projects designed to reinforce the lesson objectives were not well accepted by the majority of the class so the few that did enjoy them began to add their complaints when pressured by their peers. The one successful lesson strategy was the use of Concept Maps at the beginning of each unit. The students attended to and participated in this activity.

Radin (2009) recommended that all students need to be taught by teachers with the knowledge of brain-compatible teaching strategies that foster a learning setting. The qualitative study listed five characteristics for an enriched environment: (a) emotional involvement by teachers and students, (b) physical setting, (c) decreased stress and potential for stress, (d) variety of classroom experiences, and (e) challenging work. This research study was designed to incorporate all of these characteristics into the treatment condition but failed to create a classroom environment to facilitate learning beyond the curriculum.

An important finding from this study was that the lack of an optimal emotional climate in a classroom (BTTS 1) did not promote student learning. Even when the teacher is setting a positive atmosphere and working to engage all students, the behaviors of a few students can frequently disrupt these efforts. The treatment group had two students who daily made negative remarks, muttered under their breath, or disobeyed school rules. These types of negative behaviors did not interfere with learning the Just Words curriculum but did create a classroom climate that was negative and stressful. The importance of setting an environment that has a positive emotional climate without stress was described by many authors (Hardiman, 2003, 2012; Howard-Jones, 2010; Sousa, 2010; Willis, 2007, 2010).

Willis (2007) depicted a classroom with minimal to no stress as essential to learning. She described how the reticular activating system (RAS) of the brain is the filter that decides what is and what is not important. Since the strongest stimulus is physical need, "the brain will not be able to engage in the task of learning unless basic survival needs are first met" (p. 43). She recommended teachers be cognizant of the emotional climate of the classroom because of the power of the brain to stop new information from being learned.

Since the BTTS related to emotional climate were reported widely across the literature, specific attention was given to its implementation. Specific activities to increase the positive emotional climate included: predictability, trust and acceptance, safe environment, praise, control and choice, and celebrations (Hardiman, 2003). The treatment students had a regular schedule each day, and were provided with all of the above listed activities. The one activity that made a difference for the most difficult

treatment students was celebrations. When all of the students returned an important school paper with their parent signatures, there was a "Vending Day" celebration. Each student was given the opportunity to request two items from the vending machines. On this day, everyone in the room experienced a very positive climate. Unfortunately, this was a rare occasion.

Another negative element contributing to the negative emotional climate of the classroom was the Instructional Assistant (IA). At the start of the treatment condition, the IA was disrespected by a female student. For the duration of the treatment condition, their relationship was difficult and challenging. Despite the student's apology and the instructor's guidance and recommendations, the relationship remained negative and contributed to the negative classroom environment.

The second BTTS implemented in this study was creating the physical learning environment (BTTS 2). Hardiman (2003) describes the classroom setting as being novel and reaching all of the human sensory systems. Students pay attention to novelty. Changing posters in the room, moving lighting fixtures around, rearranging the desks/tables in the room are all ways to create novelty. The senses of seeing, hearing, smelling, touching, and tasting, along with physical movement stimulate the brain in different ways. When a teacher is seeking novelty in the classroom environment, incorporating materials or experiences that target senses and motion will stimulate the students' brains and prepare them for learning.

The BTTS related to the classroom environment were more easily carried out because the students only had one small part in manipulating the environment. The students' role in manipulating the environment was in displaying their work on the walls

and tables around the classroom. Some liked displaying their work while others thought it was too much like elementary school. It is difficult to assess the impact these environmental changes had on the treatment students. However, the only environment change the treatment students anecdotally favored was the flexible seating arrangement. The other music, lighting, and lavender-lemon scented beads were either ignored or complained about. The treatment group's schedule of having lunch in the middle of the mod allowed for significant movement during the intervention time, which was a type of environmental change. Other movement activities included going to the board to practice writing, using magnetic tiles in individual journals, and going to the media center for additional resources or to use the computers. The control group did not have these environmental opportunities, yet made similar academic gains with the Just Words curriculum.

BTTS 3 focused on designing the learning experience (Hardiman 2003, 2012). Since the brain is looking for patterns to make sense of information received, it helps to give students the big picture of what they will be learning. Once that is established the big picture can be broken down into smaller concepts so the students can begin to access prior knowledge. By applying the prior knowledge with the new information, new brain connections are made or previous ones are strengthened. To support this strategy in designing lessons, the overall unit ideas can be presented through a concept map. From the map the smaller concepts are displayed. Each concept map is based on information students have already learned so they are able to visualize the connections between prior knowledge and what will be learned. Pera (2014) describes how important it is to teach

discrete skills within a meaningful context. In backward mapping of a lesson, the specific skills are linked to concepts which are linked to the overall big picture objective.

In designing the daily lessons and activities focusing on BTTS 3 strategies for the treatment group, each unit began with a concept map. This big picture look at what the students were going to learn was introduced and referred to throughout the unit. It was important to show the students how the skills were all related to the course goal – to improve reading decoding and encoding, fluency, vocabulary, and comprehension. All of the scaffolded activities were based on the skills the students needed to master in order to move through the Just Words curriculum.

Overall, students with disabilities have struggled and experienced failure for many years prior to entering high school. Instructional efforts, including using what is known about brain function and strategies to maximize learning, can be difficult. With possibly only one semester out of the total eight during a four year high school program dedicated to increasing reading ability, it is a short 18 weeks to implement the very best instruction for a group of individuals with diverse needs. The research behind the BTTS strongly supports the implementation of these techniques with all students, especially those who have a learning style and/or rate that differs from the typical. Yet there is a certain degree of "buy in" or trust or commitment by the students in order for an optimal learning environment to be created. Despite all of these efforts, students have a choice to work or fail. Unfortunately by high school these efforts are often too little, too late. Consequently students with disabilities do not graduate at the same rate as their peers. In the past few years, during the eighth grade IEP meeting, the team is asked if the student will need four, five, or six years to finish high school. While this is only beginning to be

accepted by students and families, staying in high school longer will allow time for more interventions or interventions to be extended over more than one semester. As an intervention, the Just Words curriculum was designed to take two weeks per unit to complete. This schedule along with the bonus units and time to complete the assessments would fill up two semesters of time. Currently the school administration is reluctant to enroll students in long term reading interventions (i.e., requiring more than one semester). With the possibility of a student remaining in high school for an additional year, perhaps this strategy will be reinvestigated.

One mind, brain, education factor that has not been discussed is behavior. Howard-Jones (2010) described how learners are in fact able to respond to their own free will. Free will is something humans cherish and yet it causes behavior choices: if a student chooses to not participate in class, he/she is exercising free will. Despite numerous interventions with the difficult students in the treatment group of this study (calling the parent, establishing behavior expectations, discussing the behavior with the student and administrators), no behavior changes resulted. In general, the students given a choice about participating in a class may or may not choose what will help them most as life-long learners. When forced to remain in the class, the student is resistant to any BTTS the teacher introduces. The tremendously important BTTS 1 of setting a positive emotional climate can sometimes not be overcome. Students carry these attitudes and choices with them across many educational settings. This behavior may actually impede learning due to the build-up of stress chemicals in the brain and the negative effect they have on the individual.

One concern about the Just Words program was that it was not formally assessed by the Wilson Language Training Corporation. Instead the program is a condensed version of the Wilson Reading System (WRS) which has been researched and found to be evidence-based (What Works Clearinghouse, 2013). Implementation of WRS is not desirable by high school administrators. If a student must begin at Step One in WRS, it could be two to three years of intervention before the student would complete Step Twelve, the final step. The shorter version WRS in the Just Words curriculum may or may not be as effective. This study did not attempt to determine the efficacy of Just Words, since it was the selected curriculum of this district. Instead, we examined the added benefit of BTTS classroom strategies to the curriculum.

In a post study review of the Just Words curriculum materials and delivery techniques, it is clear that Just Words has many BTTSs embedded in the program. There is a training requirement for teachers who will deliver the Just Words curriculum. There is structure and routine to all of the lessons (BTTS 3) as well as an environment that continues to change (BTTS 2) as new concepts are learned. As new sounds are learned they are incorporated in the sound chart, students build on what they already know (BTTS3). Students move around the room periodically as they work with sound cards, partners, and choose activities (BTTS 2) (Wilson, 2009). Willis (2010) describes these activities as strategies to promote input to the prefrontal cortex. In other words, she is confirming the importance of BTTS for optimal student learning. Wilson has incorporated many of the BTTS into the curriculum and delivery model for their products.

Implications for Research

Howard-Jones (2010) indicated that adolescents as a group should be studied due to their specific social, emotional, and educational needs. Much of the research on reading is based on elementary students. This is a significant period in childhood to study as students are learning to read for the first time, however, there continue to be too many students who pass through the grades without being effective and efficient readers. They become adolescents who have experience repeated failure and are reluctant to engage in any activity that makes them different from their peers. As a unit, adolescents need research dedicated specifically to them.

Finn et al. (2014) completed an analysis of whole-brain connectivity for non-impaired and dyslexic readers; both children and adults. Findings confirm the understanding that specific brain regions are used in reading. However, in comparing over 20,000 brain connections of non-impaired readers to dyslexic readers, Finn et al. (2014) submit there are more differences in the connectivity of the dyslexic brain than previously thought. Further study of whole-brain connectivity needs to be explored as the technology to analyze reading functions advances.

The reading brain is exciting to study, read about, and dream of implications for the new knowledge. This is where further research must continue to be cautious. While having a deeper understanding of the brain when it is reading, it is imperative that the neuroscientists and educator continue to work together to determine the application of new knowledge in developing new instructional ideas. Also, the conversation needs to be two ways. The future holds true back and forth communication between scientists and educators.

This study examined the first three BTTS (Hardiman, 2003, 2012). There are three more BTTS that students would benefit from. They include: teaching for declarative and procedural knowledge, teaching for extension and application of knowledge, and evaluating learning. What an exciting and dynamic classroom it would be when all six of these BTTS are in place. Further research could be a combination of all six or selected BTTS. One model would be to stagger the implementation of the BTTS in phases. For example, implement BTTS 1 for 3 weeks, then remove and implement BTTS 2 for 3 weeks, then remove and implement BTTS 3, etc. until all six BTTS were implemented. This would work over an 18 week semester.

In preparing for this dissertation study it was surprising to see little written on the actual staff development for teachers. Teachers are at the forefront of the actual implementation of the Mind, Brain, Education research. Besides independently reading or possible small professional learning communities, there is little available to typical teachers. Teachers are no longer being reimbursed for the cost of attending conferences. Two important questions are: how are teachers getting this knowledge and who is providing it to them? The precursor to these questions is to learn what pre-service teachers are being taught regarding this pedagogy.

Another implication for future research has to do with data. Schools have gone from being data poor to being data rich. Specifically, what instructional changes for reading need to be made based on the current and historical data? Most teachers take one statistics class as undergraduates and one in their graduate program. Even if they remember some ways to analyze data, what will they do with the information? Also, with the data available, the teachers could discuss which BTTS they have implemented and the

goals they have for increased deliberately inserted BTTS through the instruction and relationships.

Implications for Practice

Using BTTS with purpose provides students opportunities to make many associations as they learn. It also strengthens the brain connections so the information is more easily retrieved and automaticity develops. Students with dyslexia or underdeveloped reading abilities present a challenge to teachers and staff every day at school. Evidence-based research is necessary to make decisions regarding the best practices for these type of students.

Allington (2007) makes a case for increased reading time at school. This is especially true for students achieving at or below the 50th percentile on reading achievement tests. When comparing students at the 90th percentile to students at the 50th percentile, the higher achieving students read more than three times as long each day and the number of words read per year was four times greater. That is comparing high achieving to average. Students reading at the tenth percentile read only 1.6 minutes per day and 51,000 words per year. The sheer volume of reading needs to increase for students, especially those who are very poor readers.

Reading in high school for an hour and a half each day is unheard of. Yet the classrooms where students were engaged in meaningful reading activities demonstrated the best achievement scores (Allington, 2006). In a high school where teachers are concerned about delivering curriculum necessary for students to earn credit for the course and in some cases take and pass high stakes assessments like the PARCC, there is little to no time for extended periods of reading except for English classes. Many students at this

level who are struggling with passing classes and assessments, still need to learn more about how to read. Explicit teaching of reading needs to occur in separate classes with teachers knowledgeable about BTTS and their purposeful implementation along with an evidence-based reading intervention.

As part of the Master Schedule of the high school at least one mod of Reading intervention per semester should be included. Since many of the students are ninth graders, it is vital to work with the middle school staffs to determine who should be enrolled in this course. Making room in the schedules of ninth and tenth graders reading at the elementary level should be a priority. Meeting and knowing the students as they enter high school is key to developing the positive emotional climate. The Control group in this study was this type of group. Students and parents need to recognize that one semester of Reading intervention is not going to be the "magic fix" they are looking for. However, with at least one year's growth in reading during one semester, having an additional semester can only be a positive use of educational time.

While preparing for and administering the PARCC assessments, teachers commented on the need for students to increase their reading stamina. The students in the Treatment group of this study were able to more quickly read single words at the end of the semester they were enrolled in Reading. To transfer this skill to reading text more fluently, students would need to be working with Instructional or Independent level text. Even though all of the students in this study were reading at the elementary level, there was a terrible mismatch in their high school level textbooks. Some of the high school departments have separate sets of textbooks that have the same content but are written at more of a middle school level. The administration provides the SRI Lexile score of every

ninth and tenth grade student in the school. Teachers can easily look this information up and determine what levels the students are reading. Knowing student reading levels can help teachers select passages for students to read and/or be read to them.

Cross-curricular teaching may work between some departments. For example, the tenth grade English class and the United States History class may come together for reading assignments and activities. Working through the designated curriculums, teachers will have students summarize, analyze, synthesize, and evaluate text (Allington, 2006; Hardiman, 2012). These are the necessary skills the Common Core require for reading and writing. Collaborating with other teachers will also help in developing instructional ideas and activities since this is a new and different way for teachers to teach and students to learn.

To maintain brain connections, spiraling back through the curriculum can be an easy strategy. This is more than re-teaching, it is a systematic review of the curriculum; going back through the concepts repeatedly. As the brain pathways become well used and the learning becomes automatic, some brain connections are actually pruned, streamlining the links in the brain (Willis, 2007). One example of streamlining the curriculum is to associate the vocabulary lists with actual texts the students are reading. Although this study did not evaluate vocabulary, it is an important part of NRP's reading pillars and included in Heller's (2013) list of necessary reading skills for adolescent readers.

Goswami (2010) describes brain imaging results that show changes in the brain following targeted phonology interventions. As taught in the Just Words curriculum, explicit teaching of phonemes and syllables is important to reading success. This is

apparently true in other languages as well. Training sounds and syllables has positive effects for students learning to read (Goswami, 2010). Seeing the brain imaging changes is another example of how intervention works.

High school students are generally adolescents. This population brings its own unique needs to the classroom. Howard-Jones (2010) cautioned to include what science is learning about the brain in all discussions about educational applications. This recommendation is to stay away from looking at scientific evidence in isolation. A truly brain-based educational program will blend the knowledge and understanding of both disciplines.

At the high school level there are very few evidence-based interventions available. In the school district where this study was completed, Just Words is a recommended and supported intervention along with the Wilson Reading System. However, during the school year of this study, only one other high school had a reading intervention class using Just Words. This raises the question, "What, if anything, is being provided for high school students reading significantly below grade level?". Very little support is offered from the central office staff due to having only one Reading Specialist to serve all of the special education teachers in the entire county. There are Reading Specialists at each high school but their main function is to support students reading at or above a seventh grade level. Identifying the appropriate interventions that are available to use with the students is of primary importance.

Thorough, discrete steps can be tedious for students. While the first four units of Just Words are essential to future learning, there needs to be a way to go faster through this beginning material. If the students feel the pace is too slow, it is difficult to keep

them engaged despite how many BTTS are implemented. The time to go slower is Units 8-14. When working with multi-syllable words, students need more time to practice. Also, there are a few advanced skills in WRS that are not included in Just Words.

So far all of the implications for practice have been directed towards the teacher-student relationship. Teacher development is crucial for all of these suggestions to be implemented. Recently, school administrators have allowed some self-selected staff development. Many teachers prefer to just have time to complete paperwork. This is not going to increase teacher capacity for being able to implement something as simple but also difficult as BTTS. Just as in the student learning, teachers need to actively get involved with the concepts; the knowledge, comprehension, application, analysis, synthesis, and evaluation in order to implement BTTS in their classrooms.

Limitations

The sample size for this study was a tremendous limitation. As stated previously, there was only one other high school in the county where this study was completed that was implementing the Just Words program. When approached, the staff at the other high school did not want to participate in the study. While sixteen students does not make a very large sample, each individual needed a reading intervention.

Besides the sample size being small, the school counselors determined the actual placement of the students in each group. Placement was based on the Reading class that best fit into a student's schedule. It is questionable if truly random groups resulted.

Due to the school master schedule the Reading intervention classes were offered in different semesters. This caused the study to be run during two separate time frames.

Another significant factor for the Treatment group was the winter of 2014 which causes considerable interruptions in class schedules. School was closed or opened late many days in the beginning of the semester. For example, class was held one day, then the next day it snowed and classes were cancelled for a day or two. This pattern lasted throughout the first half of the semester (Quarter 3). It was difficult to gain a curriculum momentum when this weather pattern continued to interrupt class schedules.

The final limitation is the threat to external validity by using the pre-test and post-test design.

Final Comment

Even though the results of this study did not confirm the belief that the implementation of strategically implemented BTTS improve student learning, the great body of research from the past and present support this effective teaching practice.

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Appendix A

Just Words Alone

(Cohort 1)

Course Outline – Fall 2013 – 2014

A - Just Words Alone

(Cohort 1)

Course Outline – Fall 2013 – 2014

Unit	Dates	Unit Topics	Notes
	8/26-8/30	Variety of Word Study Activities.	Beginning of the year-testing all students during the mod and Flex
	9/3-9/6	Continue Word Study	Continue pre-testing
1	9/9-9/13	• Letter-Keyword-Sound • Segmenting & Blending (3 snds) • Consonant digraphs • Segmenting for spelling	
2	9/16-9/20	• Blends • Segmenting & Blending (4-6 snds) • Closed syllable type and exception	
3	9/23-9/27	• Bonus letter spelling rule **ff, ll, ss, zz** • Welded sounds: **all, am,** • **an, ang, ing, ong, ung, ank, ink, onk, unk**	
4	9/30-10/4	• Base word and suffixes **–s, -es, -ing, -ed** • Plurals and action words • To/two/too	
5	10/7-10/11	• Two syllable words • Compound words • Syllable division rules • Reading/spelling words with 3 closed syllables and a suffix	
6	10/14-10/17	• Vowel suffixes **–er, -est, -ish, -en** • Consonant suffixes **-ful, less, -ment, -ness** • 1-1-1 spelling rule	
7	10/21-10/25	• Vowel-consonant-e • Sounds of /s/ • Two syllable words with closed and v-e syllables • Compound words • Suffix **-ive** • Silent e spelling rule	
	10/28-11/2	Review Units 1-7, If possible complete Bonus Unit I	Quarter 1 ends 10/30
8	11/4-11/8	• Open syllables • /y/ • Multisyllable words • Suffixes **-ly, -ty, -y**	

9	11/11-11/15	• R-controlled vowels • R-controlled words plus suffix • 1-1-1 spelling rule with r-controlled vowels	
10	11/18-11/22	• R-controlled multisyllable • Adding suffixes to multisyllable • 1-1-1Doubling rule	
	11/25-11/27	Review Units 8-10	Short week - Thanksgiving
11	12/2-12/6	• Long /a/ **ai, ay** • Long /e/ **ee, ea, ey** • Vowel team **oi, oy** • Plurals ending in /y/	
12	12/9-12/13	• Long /o/ **oa, oe, ow** • Vowel teams: **ow, ou, ue, ew, oo, ue, au, aw**	
13	12/16-12/20	• Final stable syllables **-le, -tion, -sion**	Begin Post-testing all students
	1/2-1/3	Review Units 8-13	Return from Winter Break
14	1/6-1/10	• Syllable review • Schwa • Roots and prefix review • Baseword and suffix review • Spelling rules review • Vowel suffix **-able**	
	1/13-1/17	Review Units 1-14	Final Exam 1/17

Appendix B

Just Words and Brain Targeted Teaching

(Cohort 2)

Course Outline – Spring 2013 – 2014

B - Just Words and Brain Targeted Teaching

(Cohort 2)

Course Outline – Spring 2013 – 2014

Unit	Dates	Unit Topics	Brain Targeted Teaching Activities	Notes
	1/21-1/24	Variety of Word Study Activities.	Introduce BTTM Provide list of some of the activities.	Mid-year-testing all students during the mod and Flex
	1/27-1/31	Continue Word Study	Introduce Concept Maps (CM)	Continue pre-testing
1	2/3-2/7	• Letter-Keyword-Sound • Segmenting & Blending (3 snds) • Consonant digraphs • Segmenting for spelling	CM Music Scented markers Magnet Board Sky writing	Begin introducing each unit with a Concept Map (CM).
2	2/10-2/14	• Blends • Segmenting & Blending (4-6 snds) • Closed syllable type and exception	CM Doodle/Sketch Play dough Change seats Team spelling challenge	
3	2/19-02/21	• Bonus letter spelling rule **ff, ll, ss, zz** • Welded sounds: **all, am,** • **an, ang, ing, ong, ung, ank, ink, onk, unk**	CM Wiki-sticks White board Act out vocab/story Jell-O writing	
4	2/24-2/28	• Base word and suffixes **–s, -es, -ing, -ed** • Plurals and action word • To/two/too	CM Change font on Worksheets Create a song/rap Magnet board	
5	3/3-3/7	• Two syllable words • Compound words • Syllable division rules	CM Poster Hide-and-Seek Gel strips	

Unit	Dates	Unit Topics	Brain Targeted Teaching Activities	Notes
		• Reading/spelling words with 3 closed syllables and a suffix	Technology	
6	3/10-3/14	• Vowel suffixes **–er, -est, -ish, -en** • Consonant suffixes **-ful, less, - ment, -ness** • 1-1-1 spelling rule	CM Sentence word sequence Share with a partner Magazine application Flash card activities	
7	3/17-3/21	• Vowel-consonant-e • Sounds of /s/ • Two syllable words with closed and v-e syllables • Compound words • Suffix **-ive** • Silent-e spelling rule	CM Visualization Post info on class Blog/website Vocab game – Hot Potato Music	
	3/24-3/28	Review Units 1-7, If possible complete Bonus Unit I	Students' favorites	
8	3/31-4/4	• Open syllables • /y/ • Multisyllable words • Suffixes **-ly, -ty, -y**	CM White boards Sit in a different seat Technology activity	Quarter 3 ends 3/31
9	4/7-4/11	• R-controlled vowels • R-controlled words plus suffix • 1-1-1 spelling rule with r-controlled vowels	CM Magnet boards Team spelling challenge Scented markers Sky writing	Spring Break 4/14 – 4/21
10	4/22-4/25	• R-controlled multisyllable • Adding suffixes to multisyllable • 1-1-1Doubling rule	CM Jell-O writing Flash card activities Share with a partner Magazine application	

Unit	Dates	Unit Topics	Brain Targeted Teaching Activities	Notes
	4/28-5/2	Review Units 8-10, If possible complete Bonus Unit II	Students' favorites	
11	5/5-5/9	• Long /a/ **ai, ay** • Long /e/ **ee, ea, ey** • Vowel team **oi, oy** • Plurals ending in /y/	CM Doodle/Sketch Create a song/rap Gel strips Visualization	
12	5/12-5/16	• Long /o/ **oa, oe, ow** • Vowel teams: **ow, ou, ue, ew, oo, ue, au, aw**	CM Wiki sticks Hide and Seek Sky writing Change font on worksheet	
13	5/19-5/23	• Final stable syllables **-le, -tion, -sion**	CM White boards Posters Post info on student blog/website Vocab game – Hot Potato	
	5/27-5/30	Review Units 8-13	Students' favorites	Begin Post-testing all students
14	6/2-6/6	• Syllable review • Schwa • Roots and prefix review • Baseword and suffix review • Spelling rules review • Vowel suffix **-able**	CM Play dough Act out vocab/ story Sentence word sequence Gel strips	
	6/9-6/11	Review Units 1-14	Best review activities	Final Exam 06/12/2014

Appendix C

Student Satisfaction Survey

C - Student Satisfaction Survey

Please circle your level of agreement with the following statements. Please do not put your name on the survey, it is anonymous. Thank you for your participation in this survey. We will use this information to improve our teacher trainings and classes.

Statement	Level of Agreement				
	Strongly Disagree 1	**Disagree 2**	**Neutral 3**	**Agree 4**	**Strongly Agree 5**
I like the Just Words program materials.	1	2	3	4	5
I like to see my good work hanging up in the classroom.	1	2	3	4	5
At the beginning of the week, I understood what the learning goals would be for the new unit.	1	2	3	4	5
Just Words gave me time to learn new information.	1	2	3	4	5
I like Just Words lessons better than my regular classroom lessons.	1	2	3	4	5
I like making choices in my learning activities.	1	2	3	4	5
Just Words presented material in a way that made learning fun.	1	2	3	4	5
Mrs. E. helped me feel good about myself as a learner.	1	2	3	4	5
The Just Words taught me how to remember.	1	2	3	4	5
I liked attending the Just Words class.	1	2	3	4	5

As a result of the Just Words Reading Intervention, what new strategies are you using? Please check the **YES, I used this** column for any that you have used.

Strategy	YES, I used this
Sound out by syllable type (closed, open, vowel-consonant-e, R-controlled, Double Vowel, and Final Stable Syllable)	
Prefixes, Suffixes	
Latin roots	
Scooping Syllables	
Scooping phrases	
High Frequency/Sight Words	
Demonstration Words	

Any other strategies you have used that are not listed above?

1. What was your preferred method of receiving new information?
    a. Whole Class
    b. Reading Groups
    c. Partners
    d. Individual/Alone
    e. Other _____
2. How could Just Words reading intervention class improve to better meet your needs?
3. Additional comments?

APPENDIX D

Six Syllable Types as described by Wilson (2009) (JW Manual p. 386)

D - Six Syllable Types as described by Wilson (2009) (JW Manual p. 386)

Syllable Type	Criteria for Syllable	Examples of Syllable Type in Words
Closed Syllable	· one vowel · one or more consonants after the vowel · vowel sound is short · can be combined with other syllables to form multi-syllable words	up, hat, ship
Vowel-Consonant-e Syllable	· vowel + consonant + "e" · first vowel is long · the "e" is silent · can be combined with other syllables to form multi-syllable words	bike, ape, stove
Open Syllable	· only one vowel, located at end of syllable · vowel sound is long · can be combined with other syllables to form multi-syllable words	be, shy, hi
R-Controlled Syllable	· single vowel + "r" (ar, er, ir, or, ur) · vowel is neither long nor short; controlled by sound of "r" · can be combined with other syllables to form multi-syllable words	start, fir, art
Double Vowel Syllable	· vowel teams · can be combined with other syllables to form multi-syllable words	beat, jeep, new, toy
Final Stable Syllable	· consonant + "-le" Only 3 letters, "e" is silent, consonant + "l" sound like a blend · syllable "-tion" / "-sion" Welded sounds of "-tion" or "-sion"	cradle, little, bubble vacation, expansion

Curriculum Vitae

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